

# **MANUAL OF NON – WOOD FOREST PRODUCE PLANTS OF KERALA**

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Indexes are Linked in this Report

## CONTENTS

	Page	File
Products Index	384	r.185.11
Index to Local Names	433	r.185.14
Index to Botanical Names	438	r.185.15
1 Introduction	1	r.185.2
2 Natural Habitats	2	r.185.3
3 Earlier Works	6	r.185.4
4 Data Sources	9	r.185.5
5 Importance of Non-wood Forest Produces	11	r.185.6
6 Conservation Aspects	14	r.185.7
7 Format	17	r.185.8
8 References Cited	21	r.185.9
9 NWFP Plants of Kerala	26	r.185.10
10 Glossary of Medicinal Terms	391	r.185.12
11 Index to Specimens Examined	395	r.185.13

## 1. INTRODUCTION

Non-Wood or Non-Timber Forest Produces (NWFP or NTFP), earlier known as Minor Forest Produces (MFP), include all forest products, other than timber and firewood which are considered as the major produces. Non-timber forest produces (NWFP) are of both plant and animal origin, occurring naturally or sometimes in cultivation in forested areas. As compared to animal products like ivory, honey, wax, lac, horns, musk, etc. plant products, natural and man-made, are much diversified depending upon the availability of forest type(s) and species grown in man-made forests and also the extent of forests in a given area or region. Due to the diversity and flexibility in the extraction of products, there can also be no concrete and exhaustive inventory of this resource base, and it may vary over a period of time, depending upon the fluctuations in demand.

Plant products of forest origin, other than timber and firewood, include mainly medicine and narcotic, gum and resin, tan and dye, oil and fat, spice and condiment, food and fodder, fibre and floss and bamboos and canes, apart from certain specific products or uses of plants, like pith of *Aeschynomene aspera* L. used for insulation or hat-making, sisal wax used in the manufacture of carbon paper, leaves used for making platters and cups, plants used in religious contexts, and so on. There are also alternate species used for many of them due to non-availability of the genuine product or plant in a particular region. Several plants belonging to NWFP group are also extracted or used on a large scale like bamboos, canes, medicinal plants, gums, tans, spices, etc. because of their excessive demand or industrial use.

Being linked with the life-style and livelihood of the tribal and rural population as gatherers or marketers on one side and the urban population as consumers or manufactures, on the other, this group of products are of much socio-economic importance. They form the economic base of the gatherers and marketers and the resource base for the manufactures and consumers. From a social context, their gathering forms part of the life-style of tribals and other forest dwellers, and therefore, such products are sources of both tangible and non-tangible benefits. Currently, plants which yield NWFP are also being cultivated both in forest and non-forest areas thereby acquiring importance in plantation forestry and forestry contexts.

Due to unregulated exploitation of this natural resource base, of late, there has also arisen the need to conserve many of them. Plants yielding NWFP form part of the floral diversity and it is only by conserving the natural flora that protection of NWFP plants can be fully achieved. Taking stock of the present availability and resource status of the plants and products, identification of species which deserve protection and propagation, delimitation of areas of NWFP plant concentration for overall conservation, formulating non-destructive methods of harvest and sustainable utilization and evolving methods for their regeneration are certain aspects which deserve immediate attention to ensure the continued availability of products and benefits from this group of plants in future.

## 2. NATURAL HABITATS

Kerala State, situated in the South-western part of India at 8° 18' North latitude and 74° 52' and 77° 22' East longitude covers an area of 38,863 km<sup>2</sup>. Of this, about 10292 km<sup>2</sup> (GOI, 1991) are either natural forests or forest plantations. Physiographically, the State is divisible into four zones (Map 1), namely the coastal belt (<8 m above msl), the midlands (8-75 m above msl), hilly uplands and the highlands (>75 m above msl).

The major habitat of the NWFP plants of the State is the natural forests, occurring mainly in the hilly uplands and the highlands. This forest zone also includes forest plantations which, to some extent, form the natural abode of several NWFP species, less characteristic and ecologically more plastic. Midlands, which are essentially an agricultural zone also contain few of the NWFP species in the remnants of natural vegetation that flourish in sacred groves, wastelands and homesteads. where, a few of them are also grown for their products. In the coastal belt of the State, the once luxuriant mangrove formation was rich in NWFP, for example medicinal plants. But due to intensive agriculture, urbanisation or other developmental activities, coastal belt has now been impoverished to the maximum with regard to native flora and the NWFP plants which they contain. The significance of natural and man-made forests as potential sources of NWFP plants is dealt with here for a better understanding of the habitats and sources of NWFP species of the State.

As mentioned earlier, most of the NWFP plants of the State are confined to the natural forests, even though a few of the less characteristic and ecologically plastic ones also occur in forest plantations, mostly in teak grown areas, where the vegetation is fairly undisturbed once the plantations are established for more than thirty to forty years, depending upon site conditions. This is not the case with the short rotation plantations, mainly of pulpwood species like eucalypts, where, the ground flora developed after the plantation establishment, hardly thrives



Map 1. Physiographic zones of Kerala State.

more than 10 years or so, when they are much disturbed or practically removed in the process of timber extraction. In other cases like miscellaneous or mixed plantations, where the rotation period is more than 30 years, thinning operation being less frequent and disturbance very little, there is rich growth of plants yielding NWFP. Table 1 gives the extent of natural and man-made forests in Kerala, constituting the natural habitat of NWFP plants in the State.

### Natural forests

Natural forests of Kerala, which form the major habitat of non-timber forest produce plants, are mainly of four major types. They are evergreen, semi-evergreen, moist deciduous and dry deciduous forests, with a maximum area under the moist deciduous type (Table 1). Though many characteristic items of non-timber forest products come from the evergreen and semi-evergreen forest areas, it is the moist deciduous forest tracts which are more rich and diverse in species belonging to this plant group in general. Cane, reed and bamboo areas are also seen in the broad category of evergreen and semi-evergreen forests, apart from species like *Canarium strictum* Roxb., *Curcuma aromatica* Salisb., *Elettaria cardamomum* (L.) Maton, *Kaempferia galanga* L., *Myristica malabarica* Lamk., *Rauvolfia serpentina* (L.) Benth. et Kurz, *Vateria indica* L., and so on. Shade-loving tuber and epiphytic plants and species adapted to narrow ecological niche like those growing in *Myristica* swamps are also confined to mostly semi-evergreen and adjoining forests areas. A recent assessment by Basha (1990) had shown that more than 26% of the medicinal plants of the State are found in the evergreen forests, which contribute to a major share of the non-timber forest resource of the State. In the adjoining semi-evergreen forests, representation of medicinal plants is only about 5-6%, on a rough estimate.

Moist deciduous forests of Kerala cover an area of more than 4100 km<sup>2</sup>. Even though not very compact typologically, they are floristically much diverse, forming the habitat of a maximum number of NWFP plants. There is no estimate on the total NWFP species content of this forest type. Basha (1990) has reported that about 44% of the medicinal plant species of the State grow in this forest type. Together with about 17% of ayurvedic drug plants in the dry deciduous forests, more than 60% of the medicinal plant component alone of the NWFP plants are found in the deciduous forest areas of the State. Apart from medicinal plants, there are also several other non-timber forest produce yielding plants in the deciduous forest tracts of the State. However, this is the most disturbed and highly vulnerable forest type in Kerala, where, many of the NWFP species have become rare or endangered.

The stunted, dry deciduous forests of the rain shadow belt of Marayur in Munnar

Division is the only natural Sandal belt of Kerala, which produce the aromatic sandal wood, used mainly in perfume and soap industries. The forests of the region

Table Area under different forest types and forest plantations in Kerala

Sl. No.	Natural forests/Plantations	Area in km <sup>2</sup>
<b>1. Natural forests</b>		
a.	Evergreen	2400
b.	Semi-evergreen	1080
c.	Moist deciduous	4100
d.	Dry deciduous	94
e.	Temperate forests and grasslands	188
<b>2. Forest Plantations"</b>		
a.	Teak	733.55
b.	Eucalypts	372.75
c.	Mixed plantations	328.60
d.	Miscellaneous	218.50
<b>Total</b>		<b>9515.40</b>

**Source:** KFD, 1992. Forest Statistics. (\* Includes plantations of the KFDC).

are fairly well protected and there is still a steady supply of this commercially important non-timber forest produce. Spike disease is perhaps the only adverse factor affecting the natural population of *Santalum album* L., for which suitable control measures are yet to be evolved.

Temperate forests and grasslands, which cover only a very small extent (188 km<sup>2</sup>), are situated in the highlands of the State and are mostly in a fragmented and disturbed condition. Some of the middle altitude grasslands have also been brought under pulpwood species, namely *Eucalyptus grandis*. This has resulted,



to some extent, in the impoverishment of the natural NWFP yielding plants in those areas. A few aromatic grasses, medicinal orchids and balsams, valuable trees like *Cinnamomum*, and a few sedges and grasses used for mat weaving, broom-making, thatching, etc. are some of the NWFP plants characteristic to the high altitude grasslands of Kerala.

### **Forest plantations**

A total of 1653.40 km<sup>2</sup> of the State's forest land is under plantations (GOK, 1992). They are mostly of teak, eucalypts and a few other species (Table I). While older teak plantations harbour several medicinal and other non-timber forest produce yielding plants, plantations of eucalypts are rather poor in NWFP plant content. If such eucalypt plantations are left undisturbed for 10-20 years, the area will gradually start supporting many plants yielding important forest produces. In teak plantations of Kerala, medicinal plants, food and fodder species, spice and aromatic plants, etc., which are herbaceous, tuberous, climbing or straggling in habit, are fairly well represented. Medicinal plants like *Sida cordifolia* L., *Abrus precatorius* L., *Helicteres isora* L., *Curcuma zedoaria* (Christm.) Rosc., *Curcuma aromatica* Salisb., *Rauvolfia serpentina* (L.) Benth. et Kurz, *Hemidesmus indicus* (L.) R. Br., *Adhatoda vasica* Nees, *Phyllanthus emblica* L., *Gyinnema sylvestre* (Retz.) R. Br. ex Schult., etc. are few such species found as undergrowth in teak plantations raised in the deciduous forest tracts. Because of easy accessibility, such species are also often collected and marketed by tribal and rural people. In general, forest plantations, being monocultures, are devoid of arborescent NWFP species which are more characteristic to the natural forests, requiring specific habitats for their survival and growth.

### 3. EARLIER WORKS

So far, there is no exhaustive account on the NWFP plants of Kerala. This may be partly due to lack of a complete flora of the State, which, if available would have also included NWFP plants. Available floras like Bourdillon (1908), Rama Rao (1914) and Gamble (1915-'35), either for parts of the State or for the region, deal with several NWFP plants of the State and Bourdillon (1908) and Rama Rao (1914) also recorded the major uses, availability and collection procedures of some of the NWFP plants available in the southern part of Kerala. Being a national flora, Hooker, *et al.* (1872-'97) did not attempt to go into the utilitarian aspects of thousands of species enumerated, which was beyond the scope of the flora. But, being a pioneer work on the flora of the country and adjacent regions, Hooker's (1872-'97) flora triggered the preparation of regional floras which contain notes on useful plants, including NWFP. However, in the newly published volumes of

revised Flora of India (Sharma, *et al.* 1993, Sharma and Balakrishnan, 1993, Sharma and Sanjappa, 1993, Hazra, *et al.* 1977, etc.), there are notes on various species of NWFP plants, enumerated family-wise with elaborate taxonomic details.

The second half of twentieth century witnessed the publication of several District or Forest Division floras of the State like Manilal and Sivarajan (1982), Mohanan (1984), Manilal (1988), Ramachandran and Nair (1988), Ansari (1989), Vajravelu (1990), Sivarajan (1992), Subrainanian (1990) and Mohanan and Henry (1994), wherein several NWFP plants are enumerated along with others. Also, floristic accounts of several botanically significant areas of the State are available, like those of Parambikulam and Aliyar (Sebastine and Ramamurthy, 1966), Sultans Battery (Ellis and Chandrabose, 1967), Devikolam (Sebastine and Vivekananthan, 1967), Anamudi (Shetty and Vivekananthan, 1971), Idukki (Vivekananthan, 1981), Neyyar (Joseph and Chandrasekharan, 1982), Trichur (Ramamurthy and Chandrasekharan, 1983), Pooyamkutty (Nair, 1988, 1993), Malayattoor (Nair and Kumar, 1993), and so on. In all such floristic enumerations, several NWFP plants are included, which were all considered while preparing this Manual.

Forest Working Plans serve as an important source of information on the NWFP plants of the State, prepared Forest Division-wise. In most of the Working Plans, a chapter is allotted to NWFP of the concerned Division which may be an enumeration of the plants exploited from there or a list of species whose products are licensed for collection. As Forest Working Plans are periodically revised and updated, they can be an authentic sources of information on the NWFP plants of the State, and this aspect of the Working Plan is attracting more attention now-a-days, due to the importance of this group of plants as a fast depleting but significant forest resource.

Literature on useful plants in the form of glossaries and dictionaries like those of Maheswari and Singh (1965), Nayar, *et al.* (1989) and Watt (1889-'93) deals with NWFP plants also, along with many others. Such dictionaries or accounts are prepared at country-level or product-wise, like medicinal plants of India (Kirthikar and Basu 1935; Chopra, *et al.* 1956 and 1958). Right from the time of van Rheede (1779-'91), there were attempts to prepare such inventories of useful or economically important plants, which are very many to mention here. However, *The Wealth of India: Raw Materials* (Anonymous, 1951-'76) published as 11 volumes by the Council of Scientific and Industrial Research (CSIR), New Delhi may be considered as an authentic and national inventory of all useful plants. This elaborate work includes all useful plants of the country with details on their habit, distribution, products, uses, mode of extraction and so on, arranged alphabetically by species name, along with non-plant resources given mostly against their product

names. In the preparation of the present Manual, this publication was of immense use especially in elucidating the products and their uses. This monumental work published during (1951-'76) is also being revised now with more authentic information, up-dated to the present level of knowledge. The book entitled *Indian Forest Utilization* (Anonymous, 1970) is also a similar work pertaining to the forest products of India, including timber, wherein there is a product-wise classified enumeration of NWFP plants with notes on their occurrences and major uses are given.

As literature specific to certain components of the NWFP of Kerala may be mentioned the Souvenir (Proceedings) of the Seminar on Minor Forest Produces brought out by the Tamil Nadu Forest Department (Anonymous, 1971). In this, there is an earnest endeavour to bring together the status of knowledge on the NWFP plants of the South Indian States of Andhra Pradesh, Karnataka, Kerala and Tamil Nadu and issues related mainly to their exploitation, cultivation, conservation and also judicious consumption. Royle (1885) had also dealt with the fibrous plants of India found in both forest and non-forest areas, which, of course, is a much out-dated publication.

There are also a few enumerations of medicinal NWFP plants of the State like that of Basha (1990) and Nambiar, *et al.* (1985), and fibre and oil yielding plants of former Travancore State (Sawyer, 1904 a, b), with details on the availability of such plants in the forests of Kerala. Also Basha and Nair (1993) had presented a paper on the NWFP plant resources of Kerala in a National Seminar on Forest Produces held at the Institute of Forest Genetics and Tree Breeding, Coimbatore. Nair (1984) has also elucidated the botanical resources of the Western Ghats region of India, wherein the State is situated.

Results of ethnobotanical studies conducted by Ramachandran and Nair (1981) for Cannanore District, Prasad and Abraham (1984) on the Nayadi tribals of the State and Nair and Jayakumar (1998, 1999) on the Hill-pulaya and Muthuva tribals of Chinnar Wildlife Sanctuary, Kerala, have revealed the use or collection of several NWFP plants of the State. But such studies were never complete or exhaustive either for the State or for various tribal groups dwelling in the forests of Kerala, much dependent of NWFP plants.

Krishnamurthy (1993) was the pioneer in preparing a national inventory on the NWFP of India, wherein product-wise information on hundreds of plant and animal products of non-timber use available in the forests of the country is provided. In this enumeration, Krishnamurthy (1993) provided details of different types of products, arranged alphabetically by their botanical names with details on their local names, distribution, products and their uses, mode of extraction, processing techniques, marketing details and also their cultivation practices,

wherever available. Even though, several plant taxa which yield important NWFP were somehow omitted, as a pioneering work at country-level, Krishnamurthy's (1993) account of the NWFP of India is perhaps the most important source of information on this group of products available in the country.

In several family or generic revisions, monographs or notes, there are indirect references to many of the NWFP plants of Kerala, which are cited under each taxon enumerated in this Manual. Other than the direct or indirect sources of information on NWFP plants detailed above, there is no other authentic source of information specific to the NWFP plants of Kerala, and hence this Manual of the plant group for the State assumes much importance.

## 4. DATA SOURCES

### Literature

Initially, Working Plans of all the Forest Divisions of the State were consulted to gather details on the NWFP plants available or exploited from each Division. The tentative checklist thus prepared was supplemented with more taxa of NWFP plants by consulting various dictionaries, glossaries and enumerations of useful or economic plants, including all volumes of *The Wealth of India: Raw Materials* (Anonymous, 1951-'76). The list so evolved was further cross-checked with Krishnamurthy (1993) and other ethnobotanical articles published. Discussions were also held with Forest Officials with regard to the potentiality of the species enlisted and also additions required and a final list 160 potential NWFP plant species was prepared.

Nomenclature of all the 160 taxa were corrected with the help of relevant literature pertaining to each taxon and the *International Code of Botanical Nomenclature* (1988). Nayar (1984) and Bennett (1988) were also very useful references in this endeavour. Up-to-date names, basionym, if any, and synonyms pertaining to each taxon were also finalised to include all the names to which citations to Floras like Hooker (1872-'97), Bourdillon (1908), Rama Rao (1914) and Gamble (1915-'35), and illustrations in Wight (1838-'53) and Beddome (1869-'74) could be made. Citations to recent revisions, monographs or relevant notes on various taxa, wherever available, were also gathered from articles published mainly in taxonomic journals. Also, reference to Krishnamurthy (1993) is provided for each taxon, with the exception of those taxa, not included in it. Local names, details on phenology (especially of Bamboos), notes on cultivation, data on distribution in Kerala and the World were also gathered or supplemented with the help of various references, especially the District Floras, with citations to the source.

The part 'Products and uses' was prepared mainly based on literature. Here, apart from gathering information from various sources, *Wealth of India: Raw Materials* (Anonymous, 1951-'76), *Indian Forest Utilization* (Anonymous, 1970) and Krishnamurthy (1993) were consulted and also cited under each taxon to authenticate the details given. Several medical, chemical and other technical terms are used in this part and the meanings of such terms are available towards the end of the Manual. Taxonomic notes were also prepared with the help of literature and consultation of specimens which are listed species-wise at the end of the Manual.

In this Manual, attempt has been made to present available data on the production and marketing aspects of various NWFP items, gathered mainly from the forest areas of the State. Such data include information collected first hand from the field and also those gathered from the records of The Kerala State Federation of Schedule Castes and Schedule Tribes Development Co-operatives Limited - the apex body which receive and market such products from a network of Tribal Welfare Societies located in different forest areas of the State. Also, the recent *Forest Statistics* of Kerala Forest Department (KFD, 1993) were consulted for data on the turn-over of the forest produce. However, these two documents used in this regard, eventhough contained such details for many species, were not complete for all taxa. In addition, data on the export of many of the NWFP items from the country available in Shiva, *et al.* (1996) for the period 1970-'71, 1980-'81 and 1990-'91 are given in the Manual, many of which are also extracted from the State, eventhough the exact quantity that the State contribute to this national level transaction is not clearly understood. Further, as pointed out by Shiva, *et al.* (1996), the quantity of NWFP items used locally by the forest and village dwellers is not accounted in all such records. Therefore, the data given on the production and marketing of the non-wood forest produces in Kerala is only partial and is intended mainly to show the relevance of the plant group in the economy of the State and also the country.

Being a natural resource, the availability of various products is directly related to the natural regeneration of the source-species and also the possibilities for their artificial multiplication. In this context, an attempt has been made to incorporate available data on natural and artificial regeneration aspects of the species with references like Troup (1921) and its revised edition prepared by Forest Research Institute, Dehra Dun (1975-'84). Also, Sengupta (1937), Dent (1948), Kadambi and Dabral (1955), Ghosh (1977), Luna (1996) and several other research reports and papers were consulted for such information which are cited under the various taxa enumerated. In several instances, data generated by the Kerala Forest Research Institute, either published or unpublished, have also been incorporated.

## **Herbaria**

Specimens in the Herbaria of Botanical Survey of India, Calcutta (CAL) and Coimbatore(MH), Kerala Forest Research Institute, Peechi (KFRI), Calicut University, Calicut (CALI) and Institute of Forest Genetics and Tree Breeding, Coimbatore (IFGTB) were consulted for preparation of the Manual. During such herbarium studies, information on local names, local uses, phenology, habit, distribution, etc. were noted and incorporated into the respective parts. Specimens were also consulted to clarify identity of several species and this also contributed to the preparation of taxonomic notes. Specimens consulted for the preparation of the Manual are also cited under the heading 'specimens examined' towards the end of the Manual, to authenticate the data presented.

## **Field studies**

Several observations based on the field studies were incorporated in the Manual, especially with regard to habit, morphological aspects of the plant parts, habits and other ecological details, distribution in the State and also products and their uses. Many of the species enumerated have also been collected during the study. During field studies, recording observations was given priority than specimen collection, so that more field data could be incorporated into the Manual. Extensive field observations made by the author while preparing reports like Nair (1986, 1988, 1991, 1993), and were also much useful in this regard.



## **5. IMPORTANCE OF NON-WOOD FOREST PRODUCTS**

As a natural forest resource, NWFP have both utilitarian and socio-economic importance. They not only provide useful materials to the human and cattle populations, but also earn income to a sizeable section of tribal and rural population. They provide food for the hungry, cure for the diseased, shelter for the homeless, perfume to the affluent, income to the poor, and in short NWFP enter into every walk of life of the human beings. The collection, consumption and marketing of NWFP are also part and parcel of the life-style and livelihood of the tribal and rural populations living in and around the forest areas. Compared to timber, the non-timber forest produces have very high labour potential, as they supply raw materials for the production of very many products. In a State like Kerala, where educated unemployment is very high, an appropriate management strategy of this natural resource can help to alleviate the unemployment problem to a great extent.

### **Exploitation and utilization**

As mentioned above, NWFP plants provide several items useful in day to day life, not only to the tribal and rural people, but also to the urban population. It is interesting to note that while the tribal and village people get their livelihood and/or income from these products, the urban people enjoy the facility or luxury of many of the products made from the NWFP. Though medicinal plants are common to both the above categories, the tribal and village people use them as raw drugs or as traditionally prepared drugs, while the urban people use them in the form of ready made drugs manufactured by the patented companies. Many of the items also form the back bone of small scale industries which manufacture products like soap, ayurvedic, unani and homeopathic drugs, perfumes, fibre products, furniture, handicrafts, insecticides, food and masticatory items, etc. Large industries manufacturing coarse paper, newsprint and rayon grade pulp, leather items, etc. also find their raw material source in the NWFP plants.

What is more relevant is the use of several non-timber forest produces by common man and forest dwellers in their day to day life. Medicinal herbs, famine food items, spice and aromatic products, oil for burning, insecticides, edible items, fibre materials, mat and bed making items, plant parts and fruits as substitutes for soap, poison for fishing in forest streams, colouring materials used by tribal women for beautifying their faces, etc. are some such products in daily use. The drugs prepared from the medicinal plants even cross the boundaries of the country to cater to the needs of the global population. Same is the ease with several other NWFP items, which are over-exploited resulting in the depletion of the natural resource base. A stage has now been reached that it is difficult to strike a balance between the demand and the supply. Further, many of the NWFP products are very specific in their properties and uses, and therefore, very difficult or even impossible to be substituted by synthetic products.

### **Socio-economic significance**

In the socio-economic context, NWFP play an important role in the tribal, rural and urban economy. They also generate job opportunities for tribal and rural people. Items like bamboos and canes cater to the needs of paper and pulp industries, traditional cottage industries and also handicraft artisans. In fact, the tribals get food and income from the NWFP, the poor villagers get income for their livelihood and the urban population utilize the products for a variety of purposes. Therefore, extraction, processing and marketing of NWFP have both direct and indirect linkages on the lifestyle and livelihood of tribals, backward classes and other forest dwellers on the one hand, and the common man who is the consumer, on

the other. Philip (1996 a) had analysed tribal economy in the context of NWFP collection and marketing in Kerala where involvement of co-operatives play a crucial role.

Table 2. Quantity and value of non-wood forest produces of plant origin exported from India during 1970-'71, 1980-'81 and 1990-'91 (after Shiva, *et al.* 1996).

Year	1970-'71		1980-'81		1990-'91	
Items	Quantity in Tonnes	Value in Million (Rs.)	Quantity in Tonnes	Value in Million (Rs.)	Quantity in Tonnes	Value in Million (Rs.)
Edible products	80084.62	784.90	586728.96	5745.70	202174.67	7935.15
Medicinal products	15057.21	55.23	68673.10	545.27	71485.21	1875.60
Spices	24566.35	314.77	73294.30	1380.77	76980.02	2527.87
Essential oils	816.77	36.13	1362.70	94.73	4362.41	535.35
Oil seeds/fatty oils	22565.48	66.78	7200.42	77.41	50738.88	899.48
Gums/Resins	47056.29	157.25	63519.13	69693	65615.97	1203.4
Tans/Dyes	6627.81	8.72	5442.94	23.71	8608.61	128.85
Fibres/Flosses	9187.10	22.45	3618.11	23.65	4605.67	72.46
Bamboos/Canes	1249.81	0.74	28206.57	12.42	41.26	1.03
Misc. Plant origin	4647.24	20.16	1318453	116.70	6207.27	268.00
<b>Grand Total</b>	<b>211858.68</b>	<b>1467.13</b>	<b>851230.66</b>	<b>8717.29</b>	<b>490819.97</b>	<b>15447.20</b>

It is well understood that non-wood forest produces are of very high economic potential. This is clear from the fact that, from India, apart from the country's domestic consumption and utilization of the products, on which there is no estimate available, large quantities of the items are also exported. Shiva, *et al.* (1996) had accounted the export of NWFP from India during 1970-'71, 1980-'81 and 1990-'91, including the money value, (Table 2). In fact, large quantities of the items were also imported to the country to meet the domestic demands (Table 3). From the data given, the economic potential of this group of products can be well understood, and they are also available in the natural forests of the country without much input. And perhaps, this is the only commodity which can be readily sold in the world market without much global competition, as each country has products characteristic of its own and are not produced or marketed by other countries.

Table 3. Quantity and value of non-wood forest produces of plant origin imported to India during 1970-'71, 1980-'81 and 1990-'91 (after Shiva, *et al.* 1996).

Year	1970-'71		1980-'81		1990-'91	
Items	Quantity in Tonnes	Value in Million (Rs.)	Quantity in Tonnes	Value in Million (Rs.)	Quantity in Tonnes	Value in Million (Rs.)
Edible products	238158.48	391.61	63108.59	323.11	176784.49	2285.55
Medicinal products	827.37	2.98	3304.70	21.46	3473.70	118.67
Spices	354.03	2.60	2502.53	85.13	5661.55	180.42
Essential oils	385.09	10.37	451.02	26.88	677.56	101.3
Oil seeds/fatty oils	3938.59	12.98	123.69	1.91	3718.83	64.16
Gums/Resins	5838.78	15.25	3024.15	23.93	84393.05	1068.47
Tans/Dyes	19710.32	35.76	10997.62	78.66	20571.53	357.38
Fibres/Flosses	12575.37	13.80	1138.13	8.04	491.67	5.97
Bamboos/Canes	1.27	0.005	95.22	0.02	57.71	0.84
Misc. Plant origin	16292.16	31.10	6321.82	27.03	4376.29	69.52
<b>Grand</b>	<b>298081.46</b>	<b>516.46</b>	<b>91067.47</b>	<b>596.17</b>	<b>300206.44</b>	<b>4252.29</b>

## 6. CONSERVATION ASPECTS

As in the case of any other natural forest resource, non-timber forest produce plants are also subjected to much threat. According to the factors identified by the International Union for the Conservation of Nature (IUCN), the following are the broad categories of threats to the natural flora which contain several valuable NWFP species and wild relatives of cultivars that are much useful to the mankind.

- Destruction or modification of habitats and ranges.
- Over-exploitation for commercial, scientific and educational purposes.
- Disease and pest attacks.
- Inadequacy of existing regulative mechanisms.
- Other natural and man-made factors.

As far as the NWFP plants of Kerala are concerned, almost all the above mentioned factors have contributed to the impoverishment of this natural floristic heritage. Submersion of large areas, once under forest, by the construction of multipurpose dams, removal of natural forests for the establishment of extensive commercial plantations, high grazing incidence coupled with annual fires, unscientific and destructive extraction of NWFP plant resources, microclimatic changes, physical destruction of plant wealth in selection felled forests and large scale conversion of forest areas, both legally and illegally, for arable and other purposes are some of the major factors that have contributed to the destruction of many such valuable species. The combined effects of all such destructive factors on the natural environment have resulted in overall change in the habitat, leading to inhospitable ecological conditions for the survival and multiplication of naturally growing species. This has also contributed very greatly to the scarcity or non-availability of several medicobotanical and other non-timber forest produce species. Bhat and Padmaja (1993). Amalraj, *et al.* (1993) and many other workers on medicinal plants and flora of the State had listed several such plant species of medicinal or other uses as endangered. Unfortunately, apart from such lists, no concerted attempt has been made in the past, either to conserve such species or to work out field strategies to ensure their sustained utilisation. However, the data generated by Uma Sankar, *etal.*(1996) on *Phyllanthus emblica* in the Western Ghats of Karnataka State, India, covers some of the important aspects which needs attention in any species-specific conservation programme on NWFP plants of Kerala State also.

It is also worth mentioning here that one of the main reasons for the development of Ayurvedic System of medicine in Kerala was the availability of a large number of medicinal plants in required quantities from the natural forests. If this indigenous system of treatment has to survive, conservation and sustainable management of the natural forest flora of the State is highly essential. How this is going to be achieved in a State where there is very high population pressure and consequent escalated demand for forest land and also timber and non-timber forest produces, is a matter of great concern.

### **Demand and supply**

Considerable increase is noticed in the demand for drug plants due to adoption of Ayurvedic system of treatment by people belonging to different countries all over the world. There are also other systems like Sidha, Unani, Homeopathy and Allopathy which also depend on medicinal herbs for many of their drug preparations. Do we have sufficient stock of raw materials for meeting this ever increasing demand ? Does the increasing demand lead to excessive collection of the medicinal plants and other NWFP species from their natural abode, paving

way to erosion of the resources ? How much can be the production of NWFP at the present level of forest management ? Can an increase be possible by modifying the present system of management ? Study on the above mentioned aspects will, not only throw light on the demand and supply of the non-timber forest produces, but also help to regulate their extraction on a sustained basis through appropriate management techniques.

### **Resource inventory**

A population-inventory of all the non-timber forest produce yielding plants of Kerala is highly essential to know the distribution of different species in their natural abode. This will throw light, not only on the pattern of distribution and population size, but also in locating the rare, threatened and endangered species of NWFP. This information will be highly useful for identifying *in situ* conservation areas and also to decide on the *ex situ* conservation strategies to be followed for different rare or threatened species.

### **Improved management**

Forest Departments, which are the main custodians of the natural forests and forest plantations, earlier considered non-timber forest produces in the category of minor forest produces (MFP) and attached only secondary importance to them. Now, though there is a tendency to attribute more significance to the category of NWFP, still their status remains more or less the same. As a result of this, there is no specific management practice, and in almost all areas, their extraction is neither regulated nor controlled. Knowing the potential and importance of such plants in human life, it is necessary to draw specific prescriptions in Forest Working Plans for their better management on a sustained basis.

### **Research needs**

Though much research data is available on the utilisation aspects of non-timber forest produce plants, there is little information generated so far on their extraction and conservation aspects. Studies on boosting the production of NWFP plants in their natural abode and in other available lands are to be taken up and techniques perfected. Judicious use of raw drugs in the medicine manufacturing process is also a field to be seriously considered to avoid wastage of raw materials. Scientific extraction methods will have to be developed and transferred to forest managers and also produce gatherers in order to prevent destructive harvesting of medicinal and other non-timber

forest produce plants from their natural abode. Research in the fields of *in situ* and *ex situ* conservation, cultivation technology and improvement and widening of the resource base by bioprospecting are also aspects which need immediate attention.



## 7. FORMAT

Plant taxa included in this Manual are arranged alphabetically according to their up-to-date botanical names, given as titles for each of them. For each taxon, data are arranged as per the following format. Towards the end of the Manual, product-wise classification, glossary of medical terms, species-wise list of specimens examined and indices to local and botanical names are given.

### **Nomenclature**

In this part, the up-to-date botanical name of the plant as given in the title is repeated with full citation and references to illustrations of Wight (1838-'51) or Beddome (1869-'72) and citations to national, regional or State floras and other relevant references like revisions, monographs, nomenclatural notes, etc. In case the plant is known by any other name in such references, those names are also given as synonyms with full citations and also references to relevant literature. The correct name of the plant may be followed by its basionym, if any, with its full citation. Efforts have been made to give the up-to-date and correct name of the plant, in accordance with the *International Code of Botanical Nomenclature* (1988) and also to include synonyms by which the plant is known in recent revisions, monographs or other relevant literature.

### **Local names**

Popular name(s) of the plant and/or the product by which it is known is given in this part. They are mostly names in the local language Malayalam but for the exception of a few Tamil or English names by which the plants or product are popularly known in this part of the country. In very few instances, when such local names are not available for the plant or the product, it has been mentioned as 'not known'.

### **Description**

As far as possible, a diagnostic description of the species is given in this part,

mostly covering the external and morphological characters. Habit, nature of branches/branchlets/bark/underground part, etc., nature and arrangement of leaves and their characters, floral characters including the type of inflorescence and flower, details of parts like calyx, corolla, stamens, pistil, fruit and seed are briefly described here. In this part, consistently, metric system of measurements are used.

### **Ecology**

In this part, details are given on the habitat of the plant in Kerala and whenever restricted in distribution, certain details on the known localities of occurrence of the species are also provided. Flowering and fruiting periods of the plant, as derived from field observations, herbarium records and literature, conclude this part.

### **Distribution**

The details given here are divided into two parts, namely for the Kerala State and the World. In the first part the occurrence of the species in Kerala is given based on data gathered from field, herbarium specimens and literature. Apart from giving the district names, wherever the species are widely distributed in the State, that aspect also has been made clear. The district-wise data given on the distribution of each species are only indicative and there is every possibility that it may be available in the nearby areas. The available data on distribution have also been plotted on a skeleton map of the State for easy reference. In the world distribution part, their known occurrence is given, mainly based on literature, with a view to impart overall information on the availability of the plant and also the product in other countries. This information will also facilitate further references on the plant products and their uses in other countries, other than what is recorded in this Manual.

### **Notes**

Certain details on the identity, nomenclature, etc. or the reason for including the plant in the Manual are given in this part, wherever necessary, authenticated by relevant references. This part is not necessarily given for all the taxa enumerated, as many of them are botanically distinct, nomenclaturally not confused and quite relevant for inclusion in the Manual. Therefore, wherever such aspects need no clarification or discussion, the item is omitted and is replaced by the next component of the Manual, namely 'products and uses'.

## Products and uses

In this part given for each taxon, details on the parts or products extracted and used are briefly described. The processing and utilization aspect of the product is given only in a nut-shell and relevant reference(s) authenticating the same are also provided, facilitating the gathering of more information on such aspects, wherever necessary.

## Production and marketing

In this part, available information on the turnover, price and export details of several products are given. The data is based mainly on two references, viz. *Different items of LFPP handled during 1994-'95 to 1996-'97 and pricefixed by MFP Committee per kilogram for 1997-'98* (Kerala State SC & ST Federation, 1998) and *Trends of Export and Import of Minor Forest Products in India* (Shiva, et al. 1996). The location-specific study on the collection and marketing of NWFP by Kerala Girijans (Philip, 1996b) is yet another related reference on the aspect and Anjana and Muraleedharan (1996) had also dealt with some of the marketing related issues of the NWFP in Kerala. Other sources of information pertaining to the part are given along with the references cited for each taxon.

## Regeneration

Data available on the natural and artificial regeneration of various NWFP species constitute this component of the Manual. The information given is mostly gathered from references like Troup (1921) and its revised edition (FRI, 1975-'84), Sengupta (1937), Dent (1948), Kadambi and Dabral (1955), Ghosh (1977), Luna (1996), and so on. The source of the data provided is also given species-wise.

## References cited

Under each taxon, this is the last component of the details provided. Here, an alphabetical list of references cited in the text of each taxon, to authenticate the data presented, is provided. This part is species-specific and supplements the exhaustive list of references on the plant or product groups given towards the end of the introductory chapter.

## **Indices**

Towards the end of the Manual, five indices are provided to facilitate easy reference. The first one is the Products Index in which the 160 taxa of NWFP plants dealt with in the Manual are classified into different products categories. The second index is a glossary of medical terms mentioned in the 'products and uses' part of various taxa and this is followed by a species-wise index of the herbarium specimens examined for the preparation of the Manual. The last two indices covers all the local and botanical names used in the Manual.

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## 9. NWFP PLANTS OF KERALA

### I. ABRUS PRECATORIUS L. (Papilionaceae)

#### Nomenclature

*Abrus precatorius* L., Syst. Nat. ed. 2: 472.1767; Wt. et Arn., Prodr. 236.1834; Baker in Hook.f., Fl. Brit. India 2: 175. 1876; Rama Rao, Fl. Pl. Trav. 117. 1914; Gamble, Fl. resid. Madras 1: 349.1918; Bretler, Blumea 10: 618. fig. 5. 1960; Verdc., Kew Bull. 24: 240. 1970; Nicol. et al., Intrap. Hort. Malab. 119. 1988; Krishnam., Min. For. Prod. India 452.1993.

*Glycine abrus* L., Sp. Pl. 753. 1753.

#### Local name(s)

Kunni, Kunni-kuru.

#### Description

Wiry, climbing **undershrubs** 2-4 long; **branchlets** puberulent or glabrescent; **stipules** upto 0.5 x 0.1 cm long, linear, caducous. **Leaves** alternate, paripinnate, 4-9 cm long, 16-32 foliate; **rachis** 0.5-1.8 cm long, slender; **leaflets** 1.5-3 x 0.4-0.8 cm, predominantly oblong to elliptic, glabrous above, sparsely pubescent or strigose with minute appressed hairs or glabrescent beneath, obtuse at base and apex. **Flowers** white or pinkish to lavender, upto 1.3 cm long, in axillary of terminal racemes, shorter than the leaves; **bracts** minute, deltoid, caducous; **bracteoles** almost 0.1 cm long, suborbicular; **calyx** 0.2-0.4 cm long with 5 teeth, upto 0.4 cm in long, sparsely pubescent; **corolla** upto 1.5 cm long, exserted, with the standard petal broadly obovate or suborbicular, wing petals oblong-falcate, the keel petals longer than the wings and arcuate; **stamens** 9 united into a tube split above with uniform anthers; pistil with subsessile ovary, short style and incurved and capitate stigma. **Pods** 2-



Fig. 1. *Abrus precatorius* L.

3.5 x 1-1.5 cm, rectangular, bulgy, wringled, densely warty, tomentose, 3-7 seeded; **seeds** most commonly red or scarlet with a black spot around the hilum or sometimes completely black, black and white or whitish, 0.5-0.7 x 0.4-0.5 cm, subglobose, shining (Fig.1).

**Ecology**

Winding climbers with greenish branchlets, often straggling on bushes and other low supports, especially along the hedges and in forest openings. Mature fruits break open and expose the red seeds for few days before the seeds fall. The plant flowers during March to October and bears ripe fruits by November-December.

**Distribution**

Kerala

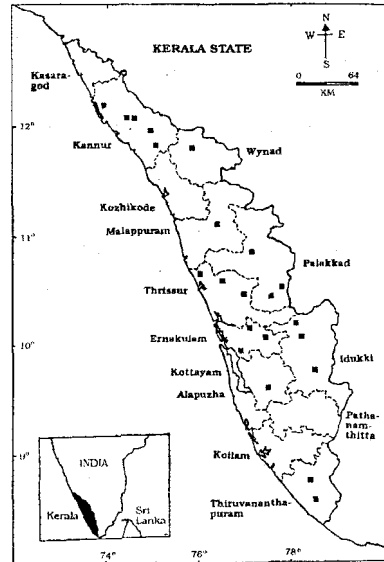
Cannanore, Wynad, Malappuram, Palghat, Trichur, Ernakulam, Idukki, Kottayam and Trivandrum districts; almost throughout the State (Map 2).

World

Pantropical.

**Notes**

*Abrus precatorius* L. var. *novaguineensis* Zipp. ex Miq., *Abrus maculatus* Noronha, *Abrus minor* Desv., *Abrus parviflorus* Desv., *Abrus squamulosus* Meyer, *Abrus abrus* (L.) Wright, *Abrus tungensis* Lima, *Abrus witteri* Baker f. and *Abrus cyaneus* Vig., some of which are recently described taxa, are all one and the same species as confirmed by Bretler (1960). It has also been reported (Bretler, 1960) that the seeds of *Abrus precatorius* may also be entirely black or white in colour which cannot be correlated with any other morphological character to taxonomically differentiate such variants.



Map 2. Distribution of *Abrus precatorius* L. in Kerala.

**Products and uses**

Roots, leaves and seeds, used medicinally, are the products extracted from this plant. The roots and leaves of *A.precatorius* contain the active principle *glycyrrhizin*, the principal constituent of liquorice, and are therefore used as a substitute for liquorice in coughs and catarrhal affections (Anonymous, 1985). Hence, the plant is also known as Indian liquorice. The roots also possess diuretic, tonic and emetic properties and are used in medicines prescribed for venereal diseases, jaundice and haemoglobinuric bile.

The seeds which contain *abrin* are poisonous, and as a suppository, are abortive. Nambiar *et al.* (1985) have also reported the seeds of *A. precatorius* as purgative, antipyretic, aphrodisiac and alexiteric and paste of seeds is also used externally for skin infections (Mohanani and Henry, 1994). The seeds contain about 2.5% of a light reddish oil and in Ayurvedic preparations, this oil is used to promote growth of human hair. The seeds which weigh about 1.75 grams (Krishnamurthy, 1993) are also used as weights to weigh precious metals like gold and also to make ornaments (Anonymous, 1985).

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## 2. ACACIA NILOTICA (L.) WILLD. EX DELILE (Mimosaceae)

### Nomenclature

*Acacia nilotica* (L.) Willd. ex Delile, Fl. Aegpt. 3: 79. 1813; Brenan, Kew Bull. 12: 84. 1957; Krishnam., Min. For. Prod. India 15, 244, 245, 323, 343, 412. 1993.

*Mimosa nilotica* L., Sp. Pl. 521. 1753.

*Acacia arabica* auct. non (Lamk.) Willd. (1808); Bedd., Fl. Sylvat. South. India t. 47. 1870; Baker in Hook.f., Fl. Brit. India 2: 293. 1878 (*pro major parte*); Bourd., For. Trees Trav. 153. 1908; Rama Rao, Fl. Pl. Trav. 150. 1914; Gamble, Fl. Presid. Madras 1: 425. 1919.

### Local name(s)

Karivelom, Karivela-maram.

### Description

Stunted, armed **trees**, upto 7 m high with short trunk; **bark** fissured, thick, dark brown, orange-yellow inside; **branchlets** densely grey-pubescent; **stipular spines** almost conical, 2-3.5 cm long, slender, dull-white, rarely absent. **Leaves** alternate, bipinnate, 4.5-9 cm long, pubescent, petiolar glandulate

with 3-7 pinnate, each 2-4 cm long; **leaflets** 18-25 pairs, 0.2- 0.5 x 0.1-0.2 cm narrowly oblong, subsessile, glabrous, oblique at base, obtuse at apex. **Flowers** dark or golden yellow, sessile, fragrant, in peduncled, globose heads, 2-6 in each axil; **peduncles** 1-2.5 cm long, grey-puberulous, bracteate; **calyx** very small, upto 0.1 cm long, 5-teethed; **corolla** with 5 short, triangular lobes upto 0.3 cm long; **stamens** 60-70 with filaments upto 0.5 cm long, basally connate and small, non-gland crested anthers; **pistil** upto 0.7 cm long with stipitate, terete ovary, style upto 0.6 cm long and small, capitate stigma. **Pods** stipitate, greyish green, 10-13x1-2 cm, densely minutely, white or grey tomentellus, torulose, turning black, dehiscent along both the sutures; **seeds** 8-12 per pod, almost 0.4 x 0.3 cm in size, exalbuminous (Fig. 2).



Fig. 2. *Acacia nilotica* (L.) Willd. ex Delile.

**Ecology**

Stunted or rarely moderate sized trees, confined to dry deciduous forests of Kerala, especially at Walayar in Palghat District. Flowers during June-July and fruits mature by December-January.

**Distribution**

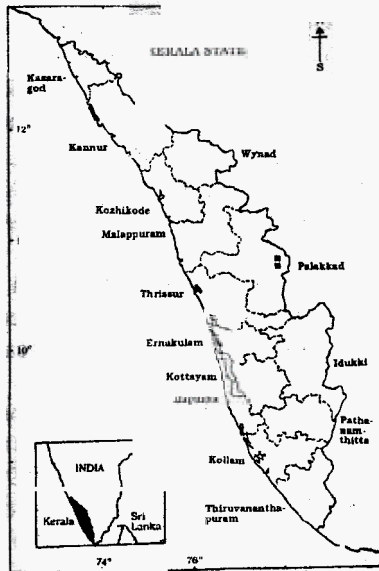
**Kerala**  
Palghat near Walayar dam, and plains, lower ghats and dry forests of southem Kerala at low elevations (Map 3).

**World**

India, Pakistan, Sri Lanka.

**Products and uses**

The bark which yields the tannin called the 'Indian gum arabic' is the non-timber product extracted from this tree, even though the real gum arabic is produced by a related species, namely



Map 3. Distribution of *Acacia nilotica* (L.) Willd. ex Delile in Kerala

*Acacia senegal* Willd. The gum is extracted by wounding the bark during summer months (March-May) and the gum appear as rounded or ovoid tears. The gum content of the bark is about 17% (Krishnamurthy, 1993). The gum is mainly used in calico-printing and dyeing. also, Used as a sizing material for silk and cotton and for the manufacture of paper. Due to its adhesive properties, it is also used as a raw material in mucilage industries.

In medicine, the Indian gum arabic is used against diarrhoea, diabetes, mellitus, sore-throat, etc. (Anonymous, 1985). The seeds of the tree are also eaten, roasted or raw, during famine and tender branches are locally used as tooth brush (Vajravelu, 1990).

### **Production and marketing**

Possibly, due to the restricted distribution of the tree in the Walayar forests of Palakkad District in Kerala State, there is no information available on the extraction and marketing of the gum in the State as understood from the records of the Kerala State SC & ST Federation (1948). However, Shiva *et al.* (1996) had recorded the export of 30 tonnes of Indian gum arabic from India during 1990-91, worth Rs. 1.4 million. Therefore, improving the natural population of the species in the State is much desired as the source of an economically important non-wood forest produce.

### **Regeneration**

This light-demanding, drought resistant and frost and fire sensitive species regenerates from seeds and through coppice growth. Production of root-suckers and pollarding capacity of the tree (Luna, 1996) makes it a potential fodder plant which is also lopped to make thorn fences. Ample sunlight, abundance of moisture, loose soil and absence of weeds are the major factors which promote natural regeneration of the species.

Artificial regeneration of *A. nilotica* can be accomplished by direct sowing of seeds or by planting nursery raised seedlings. Seeds-containing pods ripen usually by April-June and can be collected from the ground. Sun-dried pods are beaten to remove seeds. The seeds can be stored in a cool and dry place for the next sowing season or even upto 3 years without losing much viability (Dent, 1948). About 6000-10000 seeds weigh one kilogram and germination rate varies from 30-90%. As the testa is hard, the seeds exhibit dormancy, and to break this. cold water treatment for 48 hours or hot water treatment for 30 minutes followed by soaking in cold water for 24 hours is suggested (Luna, 1996). Broadcast sowing, dibbling, mound-sowing, patch-sowing, strip-sowing, trench-sowing, ridge-sowing and sowing by agri-silvicultural methods are practised with success, for which State-wise details are

available for different parts of India (FRI, 1983). Growth and yield statistics of the artificially regenerated plants are also available.

### References cited

- Anonymous, 1985. *The Wealth of India. Raw Materials*. vol. 1: A. CSIR, New Delhi. pp. 37-41.
- Dent, T.V. 1948. The storage of seeds of Indian forest plants. *Indian Forest Records - New Series 7(1) Silviculture*. Manager of Publications, New Delhi.
- FRI, 1983. *Troup's Silviculture of Indian Trees*. vol. 4. Controller of Publications, Delhi. pp. 109-113.
- Kerala State SC & ST Federation 1998. Different items of LFPP handled during 1994-95 to 1996-97 and price fixed by MFP Committee per kilogram for 1997-98. Trivandrum (unpublished)
- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi. p. 323.
- Luna, R.K. 1996. *Plantation Trees*. International Book Distributors, Dehra Dun. pp. 44-57.
- Shiva, M.P., Saritha Aswal, Abha Sharma, Pravin Mathur and Rakesh Chandra 1996. *Trends of Export and Import Minor Forest Products in India*. Centre for Minor Forest Products, Dehra Dun. 38 p.
- Vajravelu, E. 1990. *Flora of Palghat District*. Flora of India Series 111. Botanical Survey of India, Calcutta. p. 186.

### 3. ACACIA PENNATA (L.) WILLD. ( Mimosaceae )

#### Nomenclature

*Acacia pennata* (L.) Willd., Sp. Pl. 4: 1090. 1806; Wt. et Arn., Prodr. 277.834 (*pro parte*); Hook.f. in Hook.f., Fl. Brit. India 2: 297. 1876 (*pro parte*); Rama Rao, Fl. Pl. Trav. 149.1914; Gamble, Fl. Presid. Madras 1: 429. 1919.  
*Mimosa pennata* L., Sp. Pl. 522. 1753.

#### Local name(s)

Kareenja, Kareenja-patta.

#### Description

**Lianas** or climbing **shrubs**, 6-8 m high with main stem upto 3.5 cm in diameter, smooth; **branches** and **branchlets** re-curved prickly, the latter minutely light-brown-tomentellous. **Leaves** alternate bipinnate, upto 20 cm long, prickly and glandular towards the base with 7-18 pairs of pinnae, each 3-3.5 cm long; **leaflets** 30-50 pairs per pinna, slightly over-lapping, upto 0.3 x 0.1 cm, linear, sessile, glabrous with fimbriate margins, oblique or truncate at

base, mucronate at apex. **Flowers** white, pale yellow or reddish-brown, in axillary or terminal pedunculate, globose, paniced or umbellate heads, upto 1 cm in diameter; **peduncles** 1-2cm long, densely pale-brown tomentose; bracts tiny, spatulate, fimbriate at apex; **calyx** about 0.1 cm long, 5-teethed, glabrous or minutely pilose; **corolla** with 5 petals, light green below, reddish brown above, less than 0.1 cm long; **stamens** numerous, upto 0.5 cm long with filaments basally connate and small, non-gland crested anthers; **pistil** upto 0.9 cm long with stipitate, oblong, pubescent ovary, style upto 0.7 cm long and small, terminal stigma. **Pods** reddish brown, upto 14-18 x 1.5-2.5 cm, strap-shaped, stalked, dehiscent, acute at apex, bullate above seeds; **seeds** 6-12 in each pod, dark brown, ovoid to oblong, compressed (Fig. 3).



Fig. 3. *Acacia pennata* (L) Willd.

**Ecology**

Rather common in dry deciduous and disturbed forests of the rain shadow regions and hill slopes of Kerala, especially in the outskirts, scrubjungles and dry and degraded forest areas. Flowers during May to November and fruits mature by December to February.

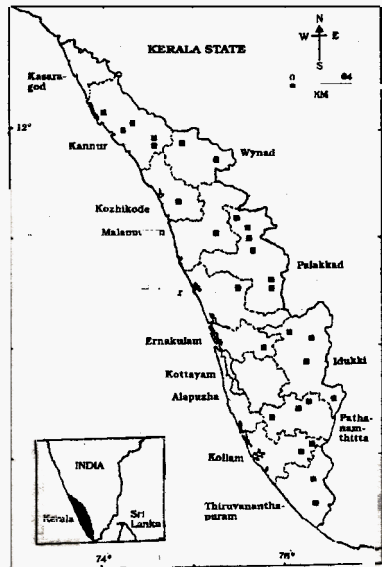
**Distribution**

**Kerala**

Wynad, Cannanore, Calicut, Malappuram, Palghat, Idukki, Pathanamthitta, Quilon and Trivandrum districts; almost throughout the State, mainly in the forests of uplands and highlands (Map 4).

**World**

India, Sri Lanka, Myanmar and other paleotropical countries.



Map. 4. Distribution of *Acacia pennata* (L) Willd. Kerala



## Products and uses

Bark and fruit-pulp are useful parts of the plant. The bark contains about 9% of tannin, brown in colour, used to tan fish nets and stilt leather. The bark is also used as a substitute for soap (Anonymous, 1958). The pulp of the fruit is reported to have piscidal properties (Purkayastha & Krishnaswamy, 1961) and the plant is also suitable for growing Kusum Lac strains. The decoction of young leaves is reported to be remedial for body pain, headache and fever (Anonymous, 1985).

## References cited

- Anonymous, 1985. *The Wealth of India: Raw Materials*. vol. I: A. CSIR, New Delhi. pp. 41-42.
- Purkayastha, B.K. and S. Krishnaswami 1961. Notes on some recorded and unrecorded plants with Kusmi strain of the lac insect. *Curr. Sci.* 30: 152.

## 4. ACACIA SINUATA (LOUR.) MERR. ( Mimosaceae )

### Nomenclature

- Acacia sinuata* (Lour.) Merr., Trans. Amer. Philos. Soc. 24(2): 186. 1935.
- Mimosa sinuata* Lour., Fl. Cochinch. 653. 1790.
- Mimosa concinna* Willd., Sp. Pl. 4:1039. 1806.
- Acacia concinna* (Willd.) DC., Prodr. 2:464. 1825; Gamble, Fl. Presid. Madras 1: 429. 1921; Nielson, Adansonia 19: 348. 1980; Krishnam., Min. For. Prod. India 342,432-433, fig. 157. 1993.
- Acacia concinna* (Willd.) DC. var. *rugata* (Lamk.) Baker in Hook.f., Fl. Brit. India 2: 297. 1878; Rama Rao, Fl. Pl. Trav. 152. 1914.
- Acacia rugata* (Lamk.) Merr., Philipp. J. Sci. Bot. 5: 28. 1910 (*non*) Benth. 1842; Gamble, Fl. Presid. Madras 1: 429. 1919; Raiz., Indian For. 92: 300. 1966.

### Local name(s)

Cheevakayi, Chikaka, Chinikka.

### Description

Armed, stout, climbing **shrubs**; **branches** brown, dotted with white. **Leaves** alternate, bipinnate, 5-9 cm long with 4-8 pairs of pinnae and sharply prickled rachis, glandular at base or below the middle between the upper most pinnae; **stipules** ovate, cordate; **leaflets** sessile, 12-25 pairs per pinnae, 0.3-1 x 0.2-0.8 cm, linear, unequal sided, glabrous, rounded or truncate at base, mucronate at apex, sensitive to touch. **Flowers** white with pinkish base, in globose, pedunculate heads, 2-3 cm in diameter, fascicled at nodes in racemose panicles towards the ends of branchlets; **bracts** conspicuous,

branous, oblique; **calyx** funnel shaped, upto 0.2 cm long, divided towards apex into 5, lanceolate teeth; **corolla** 0.2-0.3 cm long with 5, lanceolate lobes; **stamens** numerous, 0.4 cm long with basally connate filaments and small, non-gland crested anthers; **pistil** upto 0.5cm long with ovary stipitate, terete and glabrous, style upto 0.45 cm long and terminal stigma. **Pods** shortly stalked, 4-8 x 1.5-2.5cm, linearoblong, thick and fleshy when young, wrinkled and depressed between seeds when mature and dry, broadly sutured or deeply indented; **seeds** 6- 10 per pod, exalbuminous with flat cotyledons.

### Ecology

Scandent, armed shrubs or lianas, rare in the dry deciduous forest tracts, often climbing on hedges and other supports along the sides of ravines and in the forest outskirts. Flowers during March to October and fruits mature by January to April.

### Distribution

#### Kerala

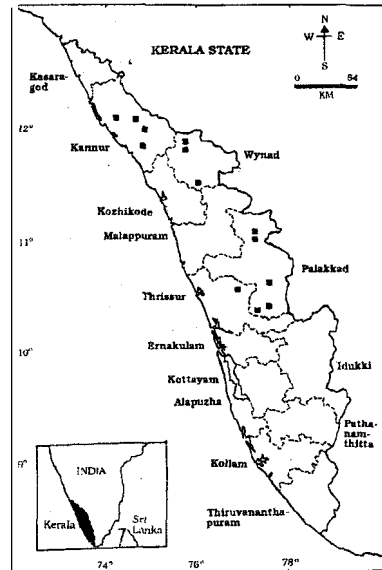
Cannanore, Wynad, Palghat and Trichur districts, in the mid and highlands and parts of South Kerala (Map 5).

#### World

India, Malesia, China, Australia.

### Notes

Nielson (1980) rejected *Acacia sinuata* as a dubious name, as he considered the plant *A. sinuata* to be the same as *Acacia concinna* (Willd.) DC. However, the specific epithet 'sinuata' is accepted here for the species, as *Mimosa sinuata* Lour' is an earlier name of the taxon as compared to *Mimosa concinna* Willd. - the basionym of *Acacia concinna* (Willd.) DC. - which Nielson (1980) used as the valid specific epithet of the species.



Map 5. Distribution of *Acacia sinuata* (L.) Merr. in

### Products and uses

Pods and young leaves are the useful products extracted from this plant. The pods called 'Shikai' are extensively used as a detergent and hence the name soap-nut. Pods are either used as such or are powdered and perfumed. They also enter into the manufacture of toilet soaps and skin ointments. Pods promote growth of hair and prevents dandruff (Krishnamurthy, 1993) and are also used by people for making sectorial marks on their forehead. The 5%

saponin content of pods makes them also a fish poison. The pods also show spermicidal properties against human semen.

The bark of the plant is used as a tanning material for fish nets. Leaves which contain oxalic, tartaric, citric, succinic and ascorbic acids are medicinal (infusion), especially for malaria fever (Anonymous, 1985) and when young, they are used for preparing chutney. The seeds are also reported to be edible after roasting.

### Production and marketing

Fruits of the tree are collected from the natural forest areas of the State in large quantities. The records of the Kerala State SC & ST Federation (1998) alone show that about 9,70,873 kg of this non-wood forest produce was received by them from its various collection centres throughout the State during 1994-95 to 1996-97. The purchase rate of the item was Rs. 14.25 per kg which the Federation disposed of at the rate of Rs. 15.00 per kilogram.

### Regeneration

This prickly shrubaceous climber seldom regenerates naturally, as the pods are often eaten away by wild animals like monkeys and sambars, and are also exploited on a large scale as the non-wood forest produce.

To regenerate the plant artificially, pods which ripen during January-February or rarely by March-April can be collected. About 660 seeds weigh one kilogram and only about 26% germination is reported (FRI, 1983). Direct sowing of seeds in patches adjacent to trees to ensure support is the usual method of artificial regeneration. Cuttings, 90-120 cm long and 10cm thick, collected from young stem portions of mother plants also sprout well when planted during the rainy season. Initial facility for the climbing of growing seedlings is essential for the establishment and growth of this woody climber.

### References cited

- Anonymous, 1985. *The Wealth of India - Raw Materials*. vol. 1:A. CSIR, New Delhi. p. 45.
- FRI, 1983. *Troup's Silviculture of Indian Trees*. vol. 4. Controller of Publications, Delhi. pp. 22-23.
- Kerala State SC & ST Federation 1998: Different items of LFPP handled during 1994-95 to 1996-97 and price fixed by MFP Committee per kilogram for 1997-98. Trivandrum (unpublished).
- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi. pp. 432-434.
- Nielson, I. 1980. Notes on Indo-Chinese Mimosaceae. *Adansonia* 19 (3) : 363.

Shiva, M.P., Saritha Aswal, Abha Sharma, Pravin Mathur and Rakesh Chandra 1996. *Trends of Export and Import of Minor Forest Products in India*. Centre for Minor Forest Products, Dehra Dun. 38 p.

5. ACACIA TORTA (ROXB.) CRAIB  
( Mimosaceae )

### Nomenclature

*Acacia torta* (Roxb.) Craib, Kew Bull. 1915:410. 1915; Gamble, Fl. Presid. Madras 1:428. 1919; Sant., J. Bombay nat. Hist. Soc. 50: 312. 1951; Nicol. *et al.*, Intpr. Hort. Malab. 120. 1988.

*Mimosa torta* Roxb., Fl. Indica 2: 556. 1832.

*Acacia caesia* Wt. *et Arn.*, Prodr. 278. 1834. (*non* Willd. 1806).

*Acacia intsia* Willd. var. *caesia* (Wt. *et Arn.*) Baker in Hook.f., Fl. Brit. India 2: 297. 1878; Rama Rao, Fl. Pl. Trav. 149 1914; Krishnam., Min. For. Prod. India 434. 1993.

### Local name(s)

Anthochini, Attu, Incha, Inna.

### Description

Armed **lianas**, 6-8 m high with main stems 4-5 cm in diameter; **bark** rough, greyish brown; **branches** glabrous, with leaf scars and 0.1-0.2 cm long, sharp, hooked thorns; **branchlets** densely to sparsely minutely tomentellous.

**Leaves** bipinnate, alternate, 7-12 cm with long, distantly hooked-thorny with 10-14 pairs of pinnae, each upto 4 cm long, glandular between the base of the upper most pinnae; **leaflets** 25-40 pairs per pinnae, overlapping, 0.5-0.9 x 0.2-0.3 cm, oblong-falcate to trapezoid, chartaceous, glabrous above, glabrescent beneath, truncate at base, mucronate at apex. **Flowers** greenish-white, sessile, in globose heads of peduncled umbels, 2-3 together on widely spaced slender racemes forming terminal panicles; **bracts** caducous; **calyx** funnel-shaped, upto 0.1 cm long, pubescent with 5, distinctly ovate or subacute lobes; **corolla** less than 0.3 cm long with 5, lanceolate, acute, lobes; **stamens** numerous, exserted, with basally connate filaments and small, non-



Fig. 4. *Acacia torta* (Roxb.) Craib.

gland crested anthers; **pistil** upto 0.6 cm long with stipitate, oblong, pubescent, ovary, almost 0.4 cm long style and small, capitate stigma. **Pods** brown-velvety when young, 8-12 x 1.5-2 cm, strap-shaped, subfalcate, reticulately veined, glabrous, acute at apex, dehiscent along the sutures; **seeds** 5-10 in a pod, flat (Fig. 4).

### Ecology

Straggling or climbing, prickly shrubs common in dry and moist deciduous forests, especially along the sides of ravines, forest outskirts and degraded areas or sometimes in the open. Flowers during March to September and fruits mature by December-January.

### Distribution

#### Kerala

Cannanore, Wynad, Palghat, Trichur, Idukki, Ernakulam, Kottayam and Pathanamthitta districts in the mid and highlands and other parts of south Kerala; almost throughout the State (Map 6).

#### World

India, Pakistan, Sri Lanka, Malesia, Thailand.

### Notes

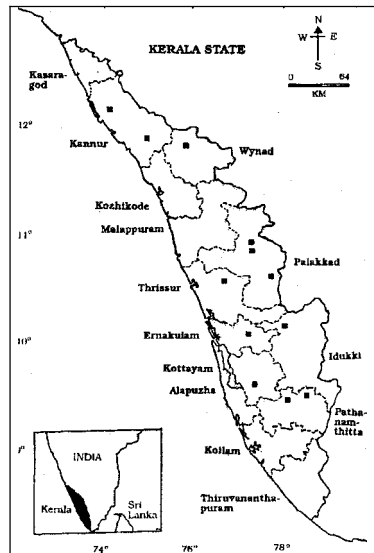
A detailed discussion on the identity of *Acacia torta* (Roxb.) Craib, *Acacia caesia* Wt. et Arn. and *Acacia intsia* Willd. var. *caesia* (Wt. et Arn.) Baker, has been given by Santapau (1952).

Even though the bark of *Acacia caesia* (L.) Willd. is also used for washing the head as reported by Rheede (Hort. Malab. 6: 7-8. t. 4. 1686), it is a different species as clarified by Nicolson, *et al.* (1988).

### Products and uses

Bark is the product extracted extensively from this woody climber. It is smooth externally and fibrous with a soapy juice inside. After softening by hammering, bark is removed from the stem and used as such, as a substitute for toilet soap or is dried and stored for later use. The bark is extracted on a very large scale from the natural forests of Kerala by cutting down the plant and debarking it.

Watt (1889) has recorded that Santal women of West Bengal, India, use the



Map 6 Distribution of *Acacia torta* (Roxb.) Craib in

flowers of this plant as a medicine to regularise deranged courses. An extract of the bark is also reported to be used as a protective coat for boats and fish-nets (Anonymous, 1985).

### Production and marketing

The bark of the woody climber is extracted on a large scale from the natural forests of Kerala, which is dried and marketed as soap-bark. While about 1,435,74 kg of the bark was procured by the Kerala State SC & ST Federation during 1994-95 to 1996-97, a lot of the material collected from forest areas might have also gone into the open market. The procurement price fixed for the item by the Federation was Rs. 11.40 per kg and the selling rate Rs. 12.00 per kg during the period. This forest produce is not exported from India (Shiva, *et al.* 1996).

### References cited

- Anonymous, 1985. *The Wealth of India: Raw Materials*. vol. 1: A. CSIR, New Delhi. pp. 45-46,
- Kerala State SC & ST Federation 1998. Different items of LFPP handled during 1994-95 to 1996-97 and price fixed by MFP Committee per kilogram for 1997-98. Trivandrum (unpublished).
- Nicolson, H. Dan, C.R. Suresh and K.S. Manilal. 1988. An Intep retation to van Rheede's Hortus Malabaricus. *Regnum Vegetabile 119*. Koeltz Scientific Books, Germany. p. 120.
- Santapau, H. 1952. Critical notes on the identity and nomenclature of some Bombay plants. *J. Bombay nat. Hist. Soc.* 50:305-312.
- Shiva, M.P., Saritha Aswal, Abha Sharma, Pravin Mathur and Rakesh Chandra 1996. *Trends of Export and Import of Minor Forest Products in India*. Centre for Minor Forest Products, Dehra Dun. 38 p.
- Watt, George 1889. *A Dictionaty of the Economic Products of India*. vol. 1. Govt. of India Press, Calcutta. pp. 50-51.

## 6. ACORUS CALAMUS L. ( Araceae )

### Nomenclature

- Acorus calamus* L., Sp. Pl. 324. 1753; Hook.f. in Hook.f., Fl. Brit. India 6: 555. 1893; Rama Rao, Fl. Pl. Trav. 428. 1914; Fisch. in Gamble, Fl. Presid. Madras 3: 1577. 1931; Suresh *et ul.*, Taxon 32: 130. 1983; Nicol. *et al.*, Intrap. Hort. Malab. 274. 1988; Krishnam., Min. For. Prod. India 24, 117. 1993.
- Acorus calamus* L. var. *verus* L., Sp. Pl. 324. 1753.
- Acorus verus* (L.) Burm.f., Fl. Malab. 10. 1769.

### Local

Vayambu.

**Description**

Stoloniferous **herbs** with branched, very aromatic rootstock, upto cm in diameter; **pseudostem** leafy, 40-60 cm high. **Leaves** simple, distichous, pale green, sheathing at base, 50-120 x 1.5-3 cm, ensiform, linear, broadened at the middle, slightly waved along the margins, acute at apex. **Flowers** yellow, 3-4 cm long, in peduncled, cylindrical spadix, 3.5-7.5 x 1-1.5 cm in size, obtuse, recurved and green; **perianth** of 6 orbicular concave segments; **stamens** 6 with linear, flat filaments and yellow, reniform anthers; **pistil** with conical, 2-3 loculed ovary and minute style and stigma. **Capsules** green, angular, 3-10-culed, turbinate, prismatic, pyramidal, 1-3 seeded; **seeds** oblong (Fig. 5).



Fig. 5. *Acorus calamus* L.

**Ecology**

Semi-aquatic, perennial aromatic plants, very rarely distributed in the marshy areas of Pettimudi above Munnar (1700m), along with grasses. During May-June, the plant is in flowers and by July-August fruits are produced. Often cultivated by tribals in their homesteads and adjoining forest areas.

**Distribution**

**Kerala**

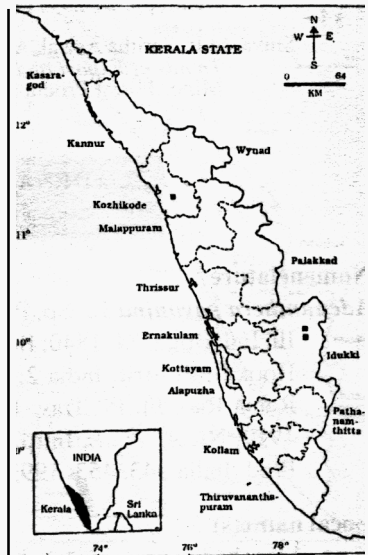
Devikulam near Munnar, Idukki District; cultivated in Calicut, Palghat and Trivandrum districts (Map 7).

**World**

India, Sri Lanka; native to America.

**Products and uses**

Vayambu is the rhizome of the plant which is extensively extracted. The rhizome is sold in the market after sun-drying. It contains 1.5-3.5% of an yellow, aromatic volatile oil (Krishnamurthy, 1993) and the glucoside *acorin* which has very high medicinal properties as an emetic, carminative and anti-spasmodic. The rhi-



Map 7. Distribution of *Acorus calamus* L.in

zomes are also used for the treatment of a host of diseases including epilepsy, chronic diarrhoea, bronchial catarrh etc. It is also used against kidney and liver complaints and rheumatism and eczema (Anonymous, 1985). It also possesses insecticidal properties. An oil called *Calamus oil* is extracted from rhizomes, and also from roots and leaves of the plant which possesses carminative, antispasmodic and anti-bacterial properties. The oil is also used in spice blends and for flavouring alcoholic beverages (Krishnamurthy, 1993).

### Production and marketing

The aromatic tubers of the plant is the exploited and marketed item. The plant growing in wild is harvested for the product in Kerala, and it is also in cultivation elsewhere in the country. From the natural forests of the State, during 1996-97, about 117 kg of the rhizomes were collected and marketed through the Kerala State SC & ST Federation (1998) at a procurement cost of Rs. 14.25 per kg and selling rate of Rs. 15.00 per kilogram. There is no record on the export of the item from India (Shrva, *et al.* 1996).

### References cited

- Anonymous, 1985. *The Wealth of India: Raw Materials*. vol. I: A. CSIR, New Delhi. pp. 63-65.
- Kerala State SC & ST Federation 1998. Different items of LFPP handled during 1994-95 to 1996-97 and price fixed by MFP Committee per kilogram for 1997-95. Trivandrum (unpublished).
- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi. pp. 24-25, 117.
- Shiva, M.P., Saritha Aswal, Abha Sharma, Pravin Mathur and Rakesh Chandra 1996. *Trends of Export and Import of Minor Forest Products in India*. Centre for Minor Forest Products, Dehra Dun. 38 p.

## 7. ADENANTHERA PAVONINA L. ( Mimosaceae )

### Nomenclature

*Adenanthera pavonina* L., Sp. Pl. 384. 1753; Wt. *et* Arn., Prodr. 271. 1834; Wt., Ill. Ind. Bot. t. 84. 1840; Bedd., Fl. Sylvat. South. India t. 46. 1870; Baker in Hook.f., Fl. Brit. India 2: 287. 1878; Bourd., For. Trees Trav. 133. 1908; Rama Rao, Fl. Pl. Trav. 147. 1914; Gamble, Fl. Presid. Madras 1: 418. 1919; Nicol. *et al.* Intrap. Hort. Malab. 120. 1988; Krishnam., Min. For. Prod. India 343, 353. 1993.

### Local

Manchadi.



**Description**

**Trees**, 15-20 m high; **bark** grey or straw coloured, smooth; **branchlets** sparsely or densely tomentellous or glabrous. **Leaves** alternate, bipinnate, upto 38 cm long with 2-6 pairs of pinnae, glabrescent or minutely pubescent; **stipules** upto 0.1 cm long; **leaflets** 5-8 pairs per pinnae, subopposite or alternate, 1-4.5 x 0.4-3 cm, elliptic to ovate, obovate or obovate-elliptic, chartaceous, glabrous above, sparsely minutely sericeous below, slightly oblique, rounded or broadly cuneate at base, rounded or emarginate at apex; **petiolules** upto 0.1 cm long. **Flowers** white turning yellowish, fragrant in solitary or paniculate, axillary racemes; **pedicels** upto 0.3 cm long, subglabrous; **calyx** campanulate, 5-toothed, glabrous, upto 0.1 cm long; **corolla** with 5 petals, upto 0.4 cm long, lanceolate or linear-lanceolate, glabrous, acute at apex; **stamens** 10, 0.2-0.3 cm long, free with slender filaments and gland-crested anthers; **pistil** 0.5 cm long with many ovuled ovary almost 0.3 cm long, subsessile and flat and style upto 0.2 cm long and simple stigma. **Pods** 8-22 x 1-1.3 cm, straight to falcate or slightly twisted, glabrous, tapering at base, acute at apex, dehiscent; **seeds** 6-15 per pod, 0.6-0.8 x 0.6-0.8 cm, scarlet-red, discoid, lenticular (Fig. 6).



Fig 6 *Adenanthera pavonina* L.

**Ecology**

Occurring wild in the moist deciduous forests of Kerala, often grown in homesteads, waysides, barren areas, gardens and so on. Flowering and fruiting during the months of January to August. The spreading crown and light green leaves make it attractive as avenue and shade trees.

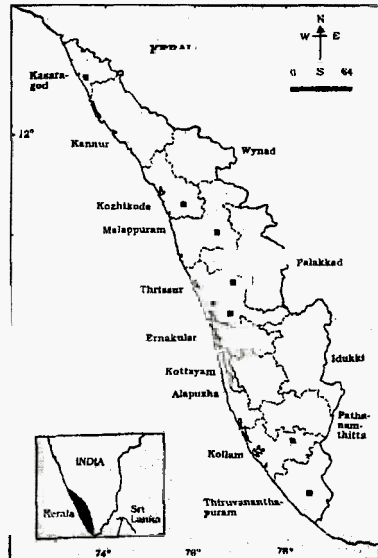
**Distribution**

Kerala

Kasaragod, Calicut, Malappuram, Trichur, Quilon and Trivandrum districts; almost throughout the State, especially in low and midlands (Map 8).

World

India, Sri Lanka, Myanmar, Thailand, Malesia, China.



Map 8 Distribution of *Adenanthera pavonina* L in

**Products and uses**

Seeds, roots, leaves, bark and heartwood are the parts extracted from this tree. Seeds are ornamental, used as weights and also in medicine against boils, inflammations, cholera and general paralysis. Seeds yield 14% of fixed oil which contains 2.5% of lignoceric acid and are therefore used for the extraction of the acid (Anonymous, 1958). The heartwood of the tree yields a red dye (Krishnamurthy, 1993) used as a substitute for red sandal (*Pterocarpus santalinus* Roxb.). The wood, apart from its uses as timber and fuelwood is also medicinal, decoction of which is reported to be curative of pulmonary affections and chronic ophthalmia. The roots of this plant are reported to be emetic. The bark is used as a detergent for cleaning hair and washing cloth and a decoction of it or of the leaves is remedial for chronic rheumatism, gout and also to check hemorrhage from bowels (Anonymous, 1985).

**Regeneration**

While there is no documented data available on the natural regeneration of the species, artificially the tree can be propagated from seeds. During July, ripened seeds will be available for collection and about 3600 seeds weigh one kilogram. Germination percentage of seeds is reported to be 72% and plant percent about 70 (FRI, 1983). Socking of seeds in hot water before sowing is noted to be better for germination as compared to untreated or cold water treated seeds. Kadambi and Dabral (1955) had reported that transplanting of naked seedlings raised in the nursery is better than stump-planting and seed sowing.

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- FRI, 1983. *Troups Silviculture of Indian Trees*. vol. 4. Controller of Publications, Delhi. pp. 84-85.
- Kadambi, K. and S.N. Dabral 1955. Studies on the suitability of different methods of artificially regenerating forest species. *Indian For.* 81: 129-151.
- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi. p. 343.

**8. ADHATODA ZEYLANICA MEDIC  
( Acanthaceae )**

**Nomenclature**

*Adhatoda zeylanica* Medic., Hist. & Commentat. Acad. Elect. Sci. Theod.-Palat. 6: 393. 1790; Nicol. *et al.*, Intrap. Hort. Malab. 3.5. 1988.

*Justicia adhatoda* L., Sp. Pl. 15. 1753.

*Adhatoda vasica* Nees in Wall., Pl. Asiat. Rar. 3: 103. 1832; Clarke in Hook.f., Fl. Brit. India 4: 540.1885; Rama Rao, Fl. Pl. Trav. 310. 1914; Gamble, Fl. Presid. Madras 2: 1082. 1921; Sant., Mem. Univ. Bombay No. 2: 92. 1951; Krishnam., Min. For. Prod. India 25,343. 1993.

### Local name(s)

Adalodakam, Adathoda.

### Description

Dense **shrubs**, 1-2.5m high; **stems** terete with yellowish bark, glabrous with the young branches pubescent. **Leaves** simple, opposite, 10-15 x 3-6 cm, elliptic-lanceolate, minutely puberulous when young, glabrous when mature, dark green above, pale beneath, cuneate at base, acuminate at apex; **petioles** 1-2 cm long, slender. **Flowers** white with rose-coloured bands in the corolla throat, in dense, axillary, 2-5 cm long pedunculate, terminal spikes; **bracts** upto 1 x 2 cm, elliptic, glabrous or subglabrous, reticulate veined, sub-acute at apex; **bracteoles** upto 2 x 0.5 cm, oblong-lanceolate, 3-nerved, acute at apex; **calyx** upto 1 cm long with lanceolate, hairy, imbricate, acute lobes; **corolla** 2-lipped, upto 3 cm long, pubescent outside, 1cm long tubular, with the upper half laterally inflated; **stamens** hairy at the base attached at the throat of the corolla tube with exerted, stout, curved filaments and basally minutely apiculate anther locules; **pistil** with ovary and lower part of style pubescent and entire stigma. **Capsules** 1.5-2 x 0.5- 1 cm, calvate, compressed, subacute or bluntly pointed at apex; **seeds** 1 or 2, upto 0.7 cm long, orbicular or oblong, compressed, tubercular-verrucose, glabrous (Fig. 7).



Fig *Adhatoda zeylanica* Medic

### Ecology

Gregarious, evergreen shrubs, often grown along hedges and in the home-steads. In wild, occasionally distributed near forest streams, banks of reservoirs and such wet areas. Flowers are produced during February to June and fruits mature by June-July or August.

## Distribution

### Kerala

Kasaragod, Cannanore, Calicut, Malappuram, Palghat, Trichur, Idukki, Pathanamthitta, Quilon and Trivandrum districts; almost throughout the State in low, mid and highlands (Map 9).

### World

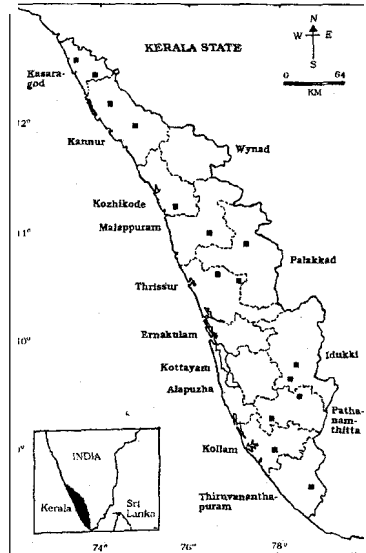
Indo-Malayan.

### Notes

The genus *Adhatoda* Mill. was earlier considered as part of the genus *Justicia* L. But, presently, it is recognised as a distinct genus, differing from *Justicia* by shrubaceous habit, shaggy ovaries and anther characters.

### Products and uses

Almost all parts of the plant are extracted and used in medicine. The alkaloid *vascine* is responsible for the very high therapeutic properties of the plant. The plant also yields the drug Vasaka, extensively used in the indigenous system of medicine, particularly against bronchitis. Also, leaves, flowers, fruits and roots of the plant are extensively used in the treatment of rheumatism (Mohan and Henry, 1994) cold, cough and asthma. Juice of leaves is also reported to be curative for diarrhoea, dysentery and glandular tumour. The alkaloid *vascine* is noted (Anonymous, 1985) to be a uteronic abortifacient. The essential oil content of leaves, flowers and roots possesses antibacterial properties and infusion of leaves functions like an insecticide and weedicide. Leaves yield a yellow dye also (Anonymous, 1985).



Map 9 Distribution *Adhatoda zeylanica* Medic Kerala

### Production and marketing

A total of 1584 kg of the medicinal roots of *A. zeylanica* was procured by the Kerala State SC & ST Federation (1998) during 1994-95 to 1996-97. The purchase cost of the item was Rs. 95.00 per kg which the Federation sold for Rs. 100.00 per kilogram.

### References cited

Anonymous, 1985. *The Wealth of India: Raw Materials*. vol. 1: A. CSIR, New Delhi. pp. 76-79.

Kerala State SC & ST Federation 1998. Different items of LFPP handled during 1994-95 to 1996-97 and price fixed by MFP Committee per kilogram for 1997-98. Trivandrum (unpublished).

Mohanan, M. and A.N. Henry 1994. *Flora of Thiruvananthapuram, Kerala*. Flora of India Series III. Botanical Survey of India, Coimbatore. p. 349.

## 9. AEGLE MARMELOS (L.) CORR. ( Rutaceae )

### Nomenclature

*Aegle marmelos* (L.) Corr., Trans. Linn. Soc. London 5: 223. 1800; Wt. *et* Arn., Prodr. 96. 1834; Wt., Ic. Pl. Ind. Orient. t. 16. 1838; Bedd., Fl. Sylv. South. India t. 161. 1869; Hook. f. in Hook. f., Fl. Brit. India 1: 516. 1875; Bourd., For. Trees Trav. 72. 1908; Rama Rao, Fl. Pl. Trav. 67. 1914; Gamble, Fl. Presid. Madras 1: 161. 1915; Nicol. et al. et al., Intrap. Hort. Malab. 231. 1988; Krishnam., Min. For. Prod. India 25, 172, 245, 343. 1993.

*Crataeva marmelos* L., Sp. Pl. 444. 1753.

### Local name(s)

Koovalam.

### Description

**Trees**, 3-7 m high; **branches** with 2-3.5 cm long, axillary thorns; **branchlets** brownish or reddish, green when very young, aromatic. **Leaves** alternate, trifoliate or palmately pentafoliate, the terminal leaflet the largest; **leaflets** 3-8.5 x 1.5-6 cm, elliptic, lanceolate, oblong or obovate, crenulate along the margins, chartaceous, glabrous, cuneate at base, obtuse at apex, the terminal one retorted and the lateral ones sessile or subsessile. **Flowers** greenish-white, fragrant, upto 2 cm long, in short, axillary panicles; **calyx** capular, upto 0.5 cm long with 4-5 triangular lobes; **corolla** with 5 petals, 1 x 0.6 cm, oblong, subequal; **stamens** numerous with filaments upto 0.3 cm, subconnate below and oblong anthers; **pistil** with ovoid, many-loculed ovary and subsessile, oblong stigma. **Berries** grey or yellowish, 10- 12 cm across, ovoid or globose with woody rind; **seeds** numerous, upto 0.8 x 0.4 cm, oblong, compressed, embedded in sacs containing sweet, orange-coloured pulp.

### Ecology

A medium sized tree, armed with sharp thorns, flowering during March to May, along with the new leaves, and fruits ripening by October-November. The tree, adapted to very varied ecological conditions like drought, frost, etc. and also suited to a variety of soils and other agro-climatic conditions, has become very rare in the natural forests of Kerala and are now available mostly in temple premises and homesteads.

## Distribution

### Kerala

Calicut, Malappuram, Palghat, Trichur and Trivandrum districts; almost throughout the State, in the mid and adjoining highlands (Map 10).

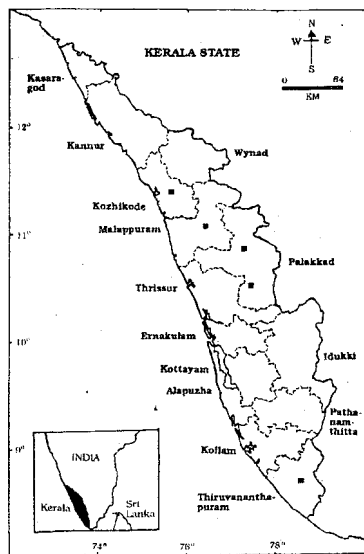
### World

India, Sri Lanka, Malesia.

## Products and uses

Fruits, bark, leaves and roots are the parts of the tree extracted. They are highly medicinal for a variety of diseases and disorders (Anonymous, 1985) and the root in particular is an ingredient of 'Dasamoola' very much used in the Ayurvedic System of Medicine.

The fruit-pulp is edible and leaves and young stems are used as fodder. The fruit pulp diluted with water and mixed with sugar and tamarind makes a delicious drink. The main trunk and thick branches produce small timber, used for making pestles of oil and sugar mills, as posts, shafts, axils, naves of carts, as catamarans and for carving. It is also used for making pulp for the manufacture of wrapping paper. The mucilaginous substance secreted around the seeds is used as an adhesive (Krishnamurthy, 1993) and also for varnishing and white-washing. The stem also yields gum. Also, the rind of the fruit yields a yellow dye. The leaves of the plant yield an essential oil on distillation having a broad spectrum of antifungal activity. The tree is also important in religious contexts, especially in the worship of Lord Shiva.



Map 10. Distribution of *Aegle marmelos* (L.) Corr. in Kerala.

## Production and marketing

On an average, one tree yields about 400 fruits at the age of 10-15 years and it may go up to 800-1000 fruits at an age of 40-50 years. Both roots and also stem-bark are extracted as the drug product, and in the market, it is the stem-bark which is more common (Anonymous, 1985). The bark is extracted from the tree at various dimensions from 20 to 120 cm long and 15 to 30 cm thickness. From the forests of Kerala, the quantity of the product extracted and marketed is not available with the Kerala State SC & ST Federation (1998) and a lot of the drug item comes from homesteads and also barren lands of the State.

## Regeneration

The tree is mostly habituated to dry localities and is draught-hardy. It coppices moderately and produces root-suckers profusely. The root system, if superficial, will promote more coppicing. Natural regeneration by seeds, in general, is inadequate. However, seeds are well dispersed by animals who relish the pulp of fruits.

For artificial regeneration, ripened fruits can be collected from standing trees during January to March. One kilogram of fruits contain about 5-7 numbers. The seeds, embeded in the mucilagenous mass inside the fruit, are removed by scooping and are cleaned by immersing in water for about 12 hours. On an average, 9997 seeds weigh one kilogram. The seeds are rather perishable (FRI, 1981), and therefore, they are to be sown soon after collection. Within 6-15 days, seeds sown in nursery beds complete their germination. On an average, 80% germination is recorded for fresh seeds and the plant percent is around 85. After about 25-30 days, the seedlings can be pricked out, potted and maintained in partial shade till the onset of monsoon, when they can be field-planted. During initial stages, growth of out- planted seedlings is rather slow and later on it improves.

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- Anonymous, 1985. *The Wealth of India: Raw Materials*. vol 1: A. CSIR, New Delhi. pp 85-91.
- FRI, 1981. *Troups Silviculture of Indian Trees*. vol. 3 Controller of Publications, Delhi. pp. 93-96.
- Kerala State SC & ST Federation 1998. Different items of LFPP handled during 1994-95 to 1996-97 and price fixed by MFP Committee per kilogram for 1997-98. Trivandrum (unpublished).
- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH. New Delhi. p. 245.

## 10. AILANTHUS TRIPHYSA (DENNST.) ALSTON (Simaroubaceae)

### Nomenclature

- Ailanthus triphysa* (Dennst.) Alston in Trim., Hondb. Fl. Ceylon 6 (suppl.) 41. 1931; Basak, Fasc. Fl. India 4: 5. 1980; Krishnam., Min. For. Prod. India 275, 343. 1993.
- Adenanthera triphysa* Dennst., Schul. zum Hort. Malab. 32. 1918.
- Ailanthus malabarica* DC., Prodr. 2: 89. 1825 (*nom. illeg.*); Wt., Ic. PI. Ind. Orient. t. 1604. 1850; Benn. in Hook.f., Fl. Brit. India I: 518. 1872; Bourd., For. Trees Trav. 73. 1908; Rama Rao, Fl. Pl. Trav. 68. 1914; Gamble, Fl. Presid. Madras 1: 116. 1915.

*Ailanthus kurzii* Prain, Indian For. 28: 133. t. 3B. 1902.

### Local name(s)

Dhup, Mattipal, Perumaram, Pongalliyam.

### Description

**Trees**, 15-30m high; **trunk** cylindrical, straight, less branched towards base, pale white or grey; **branches** and **branchlets** more or less regular and subhorizontal. **Leaves** alternate, paripinnate, crowded towards the apex of branchlets, 30-60 cm long; **leaflets** alternate or subopposite, 6-10 pairs, 6-14 x 2.5-5.5 cm, obliquely ovate-oblong or oblong-lanceolate, entire, glabrous above, glaucous beneath, unequal sided at base, acute or acuminate at apex; **petiolules** 0.3-0.6 cm, brownish, glabrous. **Flowers** yellowish-white in lax, axillary branched panicles of 20-30 cm length, bisexual or male; **pedicels** upto 0.4 cm long; **calyx** short, 5-fid with triangular, upto 0.1 cm long acute lobes, equal and imbricate; **corolla** of 5 petals, each upto 1 cm long, oblong-lanceolate; **stamens** 10 in male and 2-3 in bisexual flowers, upto 0.3 cm long, inserted at the base of the disc with friliform filaments and 2-10 culed, oblong anthers; **pistil** with 2-5 lobed ovary (rudimentary) in male flowers), connate style and 3-4 lobed, peltate stigmas. **Samaras** reddish-brown, 4.5-6.5 x 1-2 cm, linear-oblong, veined, rounded at both ends, 1-seeded in the centre (Fig. 8).



Fig 8. *Ailanthus triphysa* (Dennst) Alston

### Ecology

Rather common in semi-evergreen and moist deciduous forests of Kerala; also grown as forest plantations and in homesteads and estate boundaries in the midlands. Flowers during February-March and fruits ripen and seeds get wind dispersed by April-May.

### Distribution

Kerala

Cannanore, Calicut, Malappuram, Palghat, Trichur, Idukki, Pathanamthitta, Quilon and Trivandrum districts; almost throughout the State, mainly in the



midlands and hilly uplands, and also in cultivation elsewhere (Map 11).

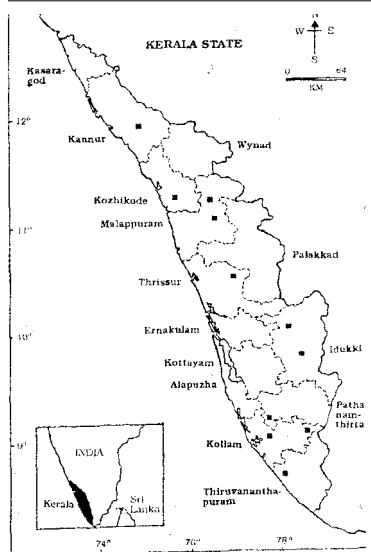
**World**

Peninsular India, extending upto Maharashtra, Andaman Islands, Sri Lanka, Myanmar, Malayasia, Thailand, Cambodia, Vietnam, Indonesia, China, Australia.

**Notes**

Basak (1980) merged the species *Ailanthus kurzii* Prain to *A. triphysa*, as the characters used to distinguish the former species from the latter were found varying and therefore taxonomically not conclusive.

The only other species of *Ailanthus* Desf. found in Kerala is *A. excelsa* Roxb. which possess leaflets with toothed margins, where as in *A. triphysa* the margins are entire. *A. excelsa* is also a softwood tree which yields an inferior type of Bassora or Hog-gum and it's bark is with febrifuge and tonic properties.



Map 11. Distribution of *Ailanthus triphysa* (Dcunst.) Alston in Kerala.

**Products and uses**

Apart from the softwood used extensively in match and plywood industries, the tree produces an aromatic resin, locally known as Mattipal. In pure form, this gum-oleoresin is very soft and watery like mollasses. It contains 2.15% ash, 2% of volatile oil, 71% alcohol soluble resin and 14.5% of non-alcohol soluble resin (Krishnamurthy, 1993). The alcohol soluble component (resin) on evaporation becomes light-brown and viscous not solidifying on exposure, even for several days.

The resin is extensively used for burning as an incense and in the manufacture of Agarbathis. It is also medicinal, used in dysentery and bronchitis and as a tonic and febrifuge (Anonymous, 1985). The resin is collected either as natural exudation from the bark or by promoting exudation by injuring the bark. The resin falls in the Elemi class and is a satisfactory substitute for gum Elemi in the manufacture of varnishes and lacquers. Krishnamurthy (1993) has further recorded that the leaves of *Ailanthus triphysa* yield black dye, used in colouring stains. The fruits are reported to contain a fatty oil (Anonymous, 1985) and are also noted to be edible (Basak, 1980).

### **Production and marketing**

Eventhough the resin item is listed by the Kerala State SC & ST Federation (1998) as a potential non-wood forest produce with its procurement cost as Rs. 38.00 per kg and the rate of sale as Rs. 40.00 per kg, there is no record on the quantity of the latex product that was procured by the Federation during 1994-95 to 1996-97. This may be due to the fact that, at present, the product is not collected and marketed on a large scale for various reasons.

### **Regeneration**

Being a light demander, natural regeneration takes place effectively only in forest areas where there is canopy opening. The seeds being light and winged, dispersal mechanism is very effective and therefore natural regeneration of the species is usually observed far away from the mother trees. The seedlings are often affected by weed growth and insufficient light (Luna, 1996).

Artificial regeneration of the species is from seeds which ripen during April-May. Seeds can be collected from the mother trees just before the wind dispersal starts by lopping branches. The seeds can be dried in shade and stored for about 3 months. They are broadcast sown in nursery beds by May, covered with a thin layer of sand and earth (FRI, 1981). Germination will start within 10 days and will be completed by about 20 days (Luna, 1996). In general, germination percentage is 50-70 and plant percent 40-60 (Ghosh, 1977). The seedlings raised in the nursery are to be transplanted during the monsoon. One year old naked seedlings are reported (Kadambi and Dabral, 1955) to give better results.

### **References cited**

- Anonymous, 1985. *The Wealth of India: Raw Materials*. vol. 1: A. CSIR, New Delhi. p. 118.
- Basak, R.K. 1980. *Simaroubaceae*. Fascicle Flora India No. 4. Botanical Survey of India, Howrah. p. 7.
- FRI, 1981. *Troup's Silviculture of Indian Trees*. vol. 3. Controller of Publications, Delhi. pp. 115-116.
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- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi. pp. 275, 343.
- Luna, R.K. 1996. *Plantation Trees*. International Book Distributors, Dehra Dun. 92-98.

**II. ALANGIUM SALVIFOLIUM (L.F.) WANG.**  
(Alangiaceae)

**Nomenclature**

*Alungium salvifolium* (L.f.) Wang. in Engl., Pflanzenr. 4: 9. 1910; Gamble, Fl. Presid. Madras. 1: 572. 1919.

*Grewia salvifolia* L.f., Suppl. 409. 1781.

*Alungium lamarckii* Thw., Enum. Pl. Zeyl. 133. 1859; Clarke in Hook. f., Fl. Brit. India 2: 741. 1879; Bourd., For. Trees Trav. 207. 1908; Rama Rao, Fl. Pl. Trav. 199. 1914.

*Alungium decapetalum* Lamk., Encyl. Meth. Bot. 1: 174. 1783; Wt., Ic. Pl. Ind. Orient. 5. 194. 1834.

**Local name(s)**

Ankolam, Arinjil, Azhinni, Kumbi, Thouttan.

**Description**

Climbing, straggling or bushy **shrubs** or stunted **trees**, upto 10m high, armed or unarmed. **Leaves** simple, alternate, 3-5 nerved at base, 10-15 x 4-12 cm, oblong or elliptic-lanceolate, entire or lobed, glabrous above, sparsely pubescent below, often rounded and unequal at base, acuminate at apex ; **petioles** upto 1.2 cm long, tomentose. **Flowers** white, fragrant, in axillary fascicles; **pedicels** upto 0.4 cm long, articulate with the ovary; **calyx** tubular, adnate to the ovary with limbs truncate or 4-10toothed; **corolla** of 10linear, valvate, thick, recurved petals; **stamens** about 20 with free or slightly connate filaments upto 1 cm long and linear, elongate anthers; **pistil** with inferior, turbinate, 1-2 loculed ovary, surmounted by a disc enclosing upto 2 cm long style and capitate, enlarged stigma. **Berries** black, ellipsoid, pubescent, upto 2 cm long, crowned by the calyx-lobes and disc; **seeds** enclosed in mucilaginous pulp.

**Ecology**

In habit, a very variable species, ie. either straggling or climbing or an erect bush or small tree, common in dry deciduous or dry rocky areas of moist deciduous forests or along forest fringes, foot hills and fallow lands. The bark of the tree is often fissured and the trunk with holes. The trees flower and bear fruits during November to May.

**Distribution**

Kerala

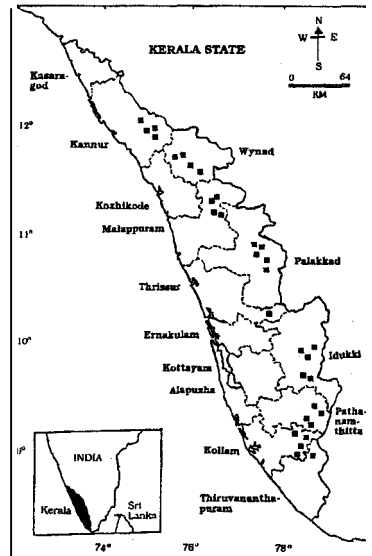
Kasaragod, Cannanore, Malappuram, Palghat, Trichur, Idukki, Quilon and Trivandrum districts (Map 12).

## World

India, Nepal and Sri Lanka to Indo-china, China, Africa.

## Products and uses

Roots, root-bark, stem-bark, leaves, fruits and seeds of the plant are medicinal. The root bark is used as a medicine for skin diseases, which is also known to possess astringent, pungent, anthelmintic, purgative and emetic properties and is also often prescribed for biliousness and colic. The drug is used either as decoction or in the powder form (Anonymous, 1985). The alkaloid present in the roots is given in small doses to check blood pressure and the root-bark exhibits antituberculosis activities. The oil from the root-bark is also externally applied or rubbed to cure rheumatism (Rama Rao, 1914; Chopra, *et al.* 1956). It is the alkaloid content of the root-bark which gives therapeutic values to this part, of which details are available (Anonymous, 1986). The roots also contain alkaloids like Cephaeline, Tubulosine, Isotubulosine, Psychotrine, Alongside, etc and possess hypotensive properties (Anonymous, 1985).



Map 12. Distribution of *Alangium salvifolium* (L.f.) Wang in Kerala.

The stem bark also with several alkaloids exhibit pharmacological activities against blood pressure. The leaves are applied as poultice in rheumatism and the edible fruits possess astringent and acidic properties. The leaves are also remedial for eye troubles (Rama Rao, 1914) and possess anti-phlematic, laxative, tonic and refrigerent properties (Anonymous, 1985). The seeds are reputed in the indigenous system of medicine for their cooling and tonic properties and is used in the treatment of haemorrhage, boils, etc and the seed oil is also an illuminant. The light brown wood of the tree is used for making musical instruments, ornamental and carved 2 items, for pestle-making and also as fuelwood (Anonymous, 1985).

## Regeneration

This slow-growing, shrub regenerates naturally from seeds, often widely dispersed by animals that relish the pulp of fruits. It can also be propagated from seeds and also gootees (Anonymous, 1985). During May to December, ripened fruits can be collected for the extraction of seeds. About 1600 seeds

weigh one kilogram. Untreated seeds give about 12% germination and hot water treatment improves it upto 20 percent. However, boiling water treatment makes the seeds non-viable. Cold water immersed seeds are reported to germinate 20-22 percent (FRI, 1985) and the plant percent is about 12. From one kilogram of seeds, approximately 200 seedlings can be obtained for outplanting.

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- FRI, 1985. *Troup's Silviculture of Indian Trees*. vol. 6. Controller of Publications, Delhi. p. 4.
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## 12. ALPINIA GALANGA (L.) SW. (Zingiberaceae)

### Nomenclature

*Alpinia galanga* (L.) Sw., Obs. Bot. 2. 1791; Baker in Hook.f., Fl. Brit. India 6: 253. 1892; Rama Rao, Fl. Pl. Trav. 404. 1914; Gamble, Fl. Presid. Madras 3: 1492. 1928; Nicol. *et al.*, Intrap. Hort. Malab. 231. 1988; Mangaly *et Sabu*, Rheedia 2 (1): 43. 1992; Krishnam., Min. For. Prod. 117, 147, 175. 1993.

*Maranta galanga* L., Sp. Pl. ed. 2: 3. 1762.

*Alpinia rheedii* Wt., Ic. Pl. Ind. Orient. t. 2026. 1853.

*Languas galanga* (L.) Stuntz, USDA. Bur. Pl. Industr. Bull. No. 261: 21. 1912; Holttum, Gard. Bull. Singapore 13: 157. 1950.

### Local name(s)

Aratha, Kolinchi, Peraratha.

### Description

Rhizomatous **herbs** with leafy aerial pseudostem, upto 2 m high. **Leaves** simple, alternate, 60-65 x 10-15 cm, oblong-lanceolate, glabrous, cuneate at base, acuminate at apex; **petioles** upto 0.5 cm long, pubescent; **ligules** almost 0.7 cm long, hairy, acute. **Flowers** greenish-white, upto 1 cm long, in terminal panicles of about 25-30 cm length, covered with two yellowish-green, bladeless sheaths; **bracts** about 2.5 x 0.7 cm, sparsely pubescent; **bracteoles** almost 1.5 x 0.5 cm in size; **calyx** greenish-white, upto 1 cm long, with minutely hairy lobes; **corolla** tubular, above cm long, unequally

lobed with the dorsal lobe upto 2 x 0.7 cm, rounded at apex and lateral lobes upto 1.5 x 0.5 cm in size; **labellum** almost 2 cm long, wavy along the margins, emarginate at apex, oblique-lined and glandular hairy; **staminodes** upto 0.5 cm long, subulate; **fertile stamens** with filaments about 1.5 cm long and anthers upto 0.7 cm long; **pistil** with wavy almost 0.3 cm long, ellipsoid ovary, filiform glabrous style and subglobose stigma. **Capsules** orange-red, about 1 x 1 cm in size, subglobose or globose with few seeds.

**Ecology**

Rhizomatous herbs with aerial pseudostem bearing white flowers during April-May and fruits during July-August. Culms are clustered and plants colonize in wet shady pockets of semi-evergreen or moist deciduous forests. The species is known in cultivation in southern Kerala.

**Distribution**

Kerala

Idukki, Pathanamthitta and Quilon districts, in the mid and highlands (Map 13).

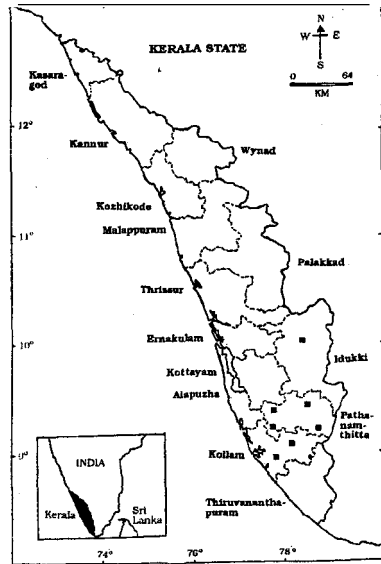
World

Wild in India, Sri Lanka, Malesia, Philippines and Borneo; cultivated throughout South-East Asia.

**Notes**

The rhizome of *A. calcarata* Rose., an allied species, is also extracted as the drug product and it has been reported that the medicinal properties of the rhizome of both the species are the same (Anonymous, 1985). However, Sivarajan and Balachandran (1994) had noted that the rhizomes of *A. galanga*

is less aromatic than that of *A. calcarata* and Nair, *et.al.* (1982) mentioned that *A. galanga* is more specifically known as Chittaratha or Aratha and *A. calcarata* as Peraratha, locally.



Map 13. Distribution of *Alpinia galanga* (L.) Sw. in Kerala.

**Products and uses**

The rhizomes of this plant, orange-brown in colour, aromatic, pungent and bitter, are highly medicinal against bronchitis and other respiratory troubles, especially in children. The drug is mainly used for clearing the voice (Anonymous, 1985). It is also used in the treatment of rheumatism, catarrhal and is a well known carminative and stomachic. The rhizomes and leaves of the

plant are reported to yield an essential oil which is a carminative and in moderate doses possess antispasmodic action on involuntary muscles (Anonymous, 1985). The oil is also used in perfumery. The rhizomes are reported to be used as condiment and seeds as spice (Krishnamurthy, 1993) which also possess insecticidal properties. The rhizomes of *Alpinia calcarata*, an allied species, is reported to possess all the properties of that of *A. galanga*, which is mostly a cultivated species (Anonymous, 1985).

### Production and marketing

As per details available with Kerala State SC & ST Federation (1998), about 5119kg of the dried tubers of *A. galanga*, and may be *A. calcarata* also, was available to the Federation, as collected from the forest areas of Kerala during 1994-95 to 1996-97. The Federation had procured the item at the rate of Rs. 14.25 per kg which they sold for Rs. 15.00 per kg, with a net profit of Rs. 3839.00 for the three financial years.

From India, during 1980-81, more than 120 tonnes of the processed rhizomes of the plant were also exported at a cost of about Rs. 0.32 million. The export of the item increased to 63 tonnes during 1990-91 (Shiva, *et al.* 1996) worth Rs. 0.52million. In fact, during 1990-91, about 20 tonnes of the rhizome was also imported to meet the domestic requirements of the country.

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- Nair, K.V., S.N. Yoganarasimhan, K.R. Kesavamurthy and Z. Mary, 1982. Studies on some of the South Indian market samples of Ayurvedic drugs. *Anc. Sci. Life* 2(3):71-78.
- Shiva, M.P., Saritha Aswal, Abha Sharma, Pravin Mathur and Rakesh Chandra 1996. *Trends of Export and Import of Minor Forest Products in India*. Centre for Minor Forest Products, Dehra Dun. 38 p.
- Sivarajan, V.V. and Indira Balachandran 1994. *Ayurvedic Drugs and Their Plant Sources*. Oxford & IBH, New Delhi. pp. 398-399.

## 13. ANAMIRTA COCCULUS (L.) WT. ET ARN. ( Menispermaceae )

### Nomenclature

*Anamirta cocculus* (L.) Wt. et Arn., Prodr. 446. 1834; Hook.f. in Hook.f., F1. Brit

India 1:98.1872; Rama Rao, Fl. P1. Trav. 11.1914; Dunn in Gamble, Fl. Presid. Madras 1:27.1915; Forman, Kew Bull. 32: 329.1978; Nicol. *et al.*, Intrap. Hort. Malab. 179.1988; Krishnam., Min. For. Prod. India 26,441. 1993.

*Menispermum cocculus* L., Sp. P1. 340.1753.

*Anamirtu paniculata* Colebr., Trans. Linn. Soc. London 13: 66. 1822.

### Local name(s)

Kadalavanakku, Nangin-kuru, Pella.

### Description

**Lianas**, 10-15 m high; **bark** thick, vertically furrowed or corrugated; **branchlets** glabrous. **Leaves** simple, alternate, 4-12 x 3.5-10.5 cm, broadly-ovate, subcoriaceous, glabrous above, paler beneath, tufted hairy in the nerve axils beneath, rounded or subcordate at base, ovate, acute or obtuse at apex; **petioles** 2.5-7.5 cm long, terete, striate, thickened towards base. **Flowers** greenish-white, foetid in drooping, thick, glabrous dioecious panicles, 15-22 cm long, produced from axils of old leaves; **pedicels** upto 1 cm long, divaricate; **tepals** outer 3 and inner 3+3, upto 0.5 cm long, subequal, ovate-oblong, concave, glabrous, ultimately reflexed; **corolla** absent; **stamens** in male flowers with anthers forming a globose head on short, stout column of coherent filaments, subrectangular; **pistil** in female flowers with 5-6 carpels, produced on short, globose, gynophore, surrounded by bifid, fleshy 6 staminodes at base and sessile, reflexed stigma. **Berries** white, often turning purple, almost 1 cm across, globose 1-2 carpellate on thickened branches of the gynophore, smooth; **seeds** black subreniform-globose, rugulose, dorsally grooved.

### Ecology

Large, woody climbers with thick, dark green leaves, often climbing on tall trees with foliage spreading on the top of the canopy of the support. The plant is seen mostly in moist deciduous forests, especially in valleys and shaded areas. The species is rarely distributed in homesteads and especially in sacred groves. Flowers and fruits are borne during August to March.

### Distribution

#### Kerala

Kasaragod, Cannanore, Calicut, Malappuram, Palghat, Trichur, Ernakulam, Idukki, Pathanamthitta, Quilon and Trivandrum districts; almost throughout the State, mainly in the mid and highlands (Map 14).

#### World

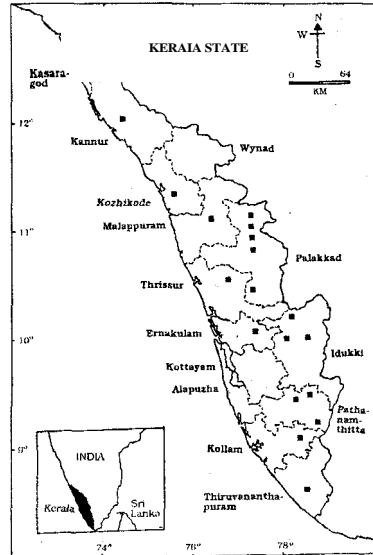
India, Sri Lanka, South-East Asia, New Guinea.



## Products and uses

Fruits are collected and used as fish, crow and cattle poison which is also fatal to man. They also possess insecticidal properties. Medicinally, seeds are used in the treatment of rheumatism, as narcotic and as an antidote for chloral poison and morphine. The fruits are also considered as an expectorant (Nambiar *et al.*, 1985) and juice of fresh fruits is used to cure ulcers, scabies and other chronic skin diseases (Krishnamurthy, 1993). The seeds which contain picrotoxin are used to cure night sweats in phthisis and in the treatment of schizophrenia (Martindale, 1977). The leaves are also medicinal as antipyretic. The fruits are collected, sun-dried and stored or marketed.

The fresh leaves are reported to be used in the making of a snuff used in the treatment of ague (Anonymous, 1985) and in Philippines, dried leaves are considered as a substitute for tobacco. The strong vines and also the bark are made into ropes, used especially during monsoon.



Map 14. Distribution of *Anamirta cocculus* (L.) Wt et Arn in Kerala.

## Production and marketing

Dried fruits are collected from natural forests and the seeds known as Cocculus in trade is extracted and marketed. Dark coloured seeds are preferred (Anonymous, 1985) for their medicinal value. There is no record with the Kerala State SC & ST Federation (1998) on the quantity of the item that was gathered and marketed from the State forests during 1994-95 to 1996-97 and possibly certain quantity of the seeds might have also been sold directly by the product gatherers in open market.

## References cited

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Martindale, 1977. *The Extra Pharmacopoeia*: Martindale ed. 24. The Pharmaceutical Press, London.

Nambiar, V.P.K., N. Sasidharan, C. Renuka, M. Balagopalan 1985. Studies on the Medicinal Plants of Kerala Forests. *KFRI Research Report No. 42*. KFRI, Peechi. p. 3.

**14. ANDROGRAPHIS PANICULATA (BURM.F.) WALL. EX NEES**  
(Acanthaceae)

**Nomenclature**

*Andrographis paniculata* (Burm. f.) Wall. ex Nees in Wall., Pl. Asiatick. Rar. 3: 116. 1832; Wt., Ic. Pl. Ind. Orient. t. 5 18. 1842; Clarke in Hook. f., Fl., Brit. India 4: 501. 1884; RamaRao, Fl. Pl. Trav. 307. 1914; Gamble, Fl. Presid. Madras 2: 1048. 1924.

*Justicia paniculata* Burm. f., Fl. Indica 9. 1768.

*Andrographis subspatulata* Clarke in Hook. f., Fl. Brit. India 4: 502. 1884.

**Local name(s)**

Kiriath, Kiriayattu, Nilaveppu, Kara-kanjiram, Amukkiram.

**Description**

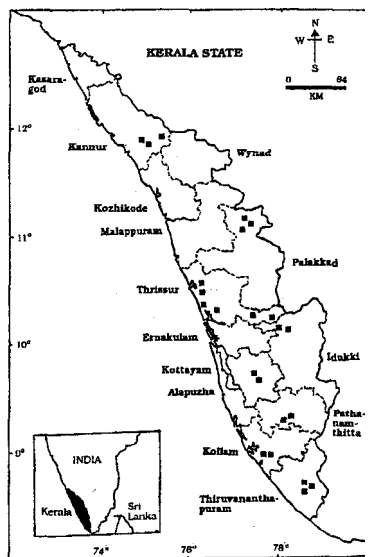
Much branched, glabrous **herbs**. **Leaves** simple, opposite, upto 12 x 3.5 cm, elliptic-lanceolate, entire, glabrous; **petioles** upto 1.5 cm long. **Flowers** pale purple, many, in much branched, glandular hairy, axillary or terminal panicles; **calyx** 5 lobed, hairy, cuneate at base, upto 0.3 cm long; **corolla** 2 lipped, upto 1.5 cm long with acute, glandular hairy lobes; **stamens** 2, anthers bearded; **pistil** with ovary puberulus and hairy style. **Capsules** oblong, hairy, acute, compressed, 8-10 seeded.

**Ecology**

Common in moist deciduous and dry deciduous forests and also in the plains. The plant flowers and bear fruits during August to December.

**Distribution**

Cannanore, Calicut, Malappuram,



Map 15. Distribution of *Andrographis paniculata* (Burm f.) Wall. ex Nees in Kerala.

Trichur, Kottayam, Quilon and Trivandrum districts; almost throughout State (Map 15).

#### World

Peninsular India, Sri Lanka.

### Products and uses

The entire plant is medicinal, known as Kalmegh or Green Chiretta and forms the principal ingredient of a house hold medicine called Alui. The drug is reported to be a specific remedy for all types of fevers and especially intermittent temperature. It is a laxative and possess dry, cooling and bitter properties, light and is remedial for sannipata type of fever, difficulty in breathing, homopathy due to the morbidity of 'Kapha' and 'Pitta', burning sensations, cough, oedema, thirst, skin diseases, fever, ulcer and worms. It is also curative for acidity and liver complaints (Aiyer and Kolammal, 1962). A decoction of the plant is also a blood purifier. The plant extract exhibits anti-typhoid and antifungal activities.

Macerated leaves and juice of the plant together with certain spices such as cardamom, clove and cinnamon are made into pills and used for stomach ailments in infants. A decoction or infusion of the leaves is also useful in general debility and dyspepsia. Green leaves of *A. paniculatum* along with that of *Aristolochia indica* L. and the fresh inner root bark of country Sarsaparilla made into an electuary is a Unani tonic and alterantive for syphilitic cachexia and foul syphilitic ulcers. The Yandes, a wandering tribe in South India, make pills from the fresh leaves of the plant and pulp of ripe tamarind, which they consider as an antidote of the venom of cobra. The leaves and roots of *A. paniculata* are also used as fabrifuge, tonic, stomachic, cholagogue and anthelmintic. A tincture of the root is also a tonic, stimulant and aperient. The high therapeutic value of the plant is due to its action machanisms by enzyme induction.

### Production and marketing

The whole plant is extracted for medicinal purposes. The item is listed as one of the non-wood forest produce which the Kerala State SC & ST Federation (1998) handle at present and the cost fixed for the item during 1994-95 to 1996-97 was Rs. 15.00per kilogram. However, the quantity of the product that the Federation handled during the period is not available. Also, certain quantity of the drug product might have gone into open market, of which there is no estimate available. Shiva, *et al.* (1996) had not included it as a NWFP, exported form India.

### References cited

- Aiyar, A.N. and M. Kolammal 1962. *Pharmacognosy Ayurvedic Drugs*. No. 4. Trivandrum. p. 63.

Kerala State SC & ST Federation 1998. Different items of LFPP handled during 1996-97 and price fixed by MFP Committee per kilogram for 1997-98 Trivandrum (unpublished).

Shiva, M.P., Saritha Aswal, Abha Sharma, Pravin Mathur and Rakesh Chandra 1996. *Trends of Export and Import of Minor Forest Products in India*. Centre for Minor Forest Products, Dehra Dun. 38 p.

15. ANTIARIS TOXICARIA LESCHEN.  
( Moraceae )

**Nomenclature**

*Antiaris toxicaria* Leschen., Ann. Mus. Hist. nat. Paris 16: 478. 1810; Hook.f. in Hook.f., Fl. Brit. India 5: 537. 1888; Bourd., For. Trees Trav. 372. 1908; Rama Rao, Fl. Pl. Trav. 385. 1914; Gamble, Fl. Presid. Madras 3: 1367. 1928; Krishnam., Min. For. Prod. India 379. 1993.

*Antiaris saccidora* Dalz. in Wt., Ic. Pl. Ind. Orient. t. 1958. 1953.

*Antiaris innoxia* Bl. in Bedd., Fl. Sylvat. South. India t. 307. 1873.

**Local name(s)**

Ara-anjili, Aranjalli, Maravuri, Nettavil.

**Description**

Large deciduous **trees**, 30-40 m high with monopodial, buttressed trunk upto 1 m in diameter and spreading terminal branches; **bark** greyish-white smooth, slightly fissured, lenticellate-pusillate externally and whitish turning reddish brown and fibrous inside, with creamy-white latex. **Leaves** simple, alternate, bifarious, 3-18 x 2-9.5 cm, elliptic, subovate or elliptic-obovate, hispid along the nerves below when young, glabrous when mature, entire or serrulate along margins, cordate or cuneate at base, acute or subacuminate at apex; **petioles** 2.5-9.5 cm long, brown-hispid when young. **Flowers** greenish, monoecious, with male flowers in axillary receptacles, 3-4 together, surrounded by bracts and female flowers solitary, enclosed in pear-shaped axillary, sessile, velvety involucre of numerous confluent bracts; **male flowers** with 3-4 sepals, 3-8 stamens with erect filaments and without pistillodes; **female flowers** without perianth, ovary adnate to the involucre and 2 subulate style arms, often recurved. **Drupes** red-crimson when ripe, 1.5-2.5 x 1-2 cm, ellip-



Fig. 9. *Antiaris toxicaria* Lesschen

soid or pyriform, 0.2-0.8 cm long, stalked, turning finally black, fleshy, 1-seeded; **seeds** 1-1.5 cm long with crataceous, hard testa and thin endocarp (Fig. 9).

**Ecology**

Huge evergreen or semi-evergreen trees with large, buttressed base and dark, rough bark, rather rare in evergreen and semi-evergreen forests of Kerala. Flowers are produced during September-October and ripened fruits are seen during January to May. Old trees often get hollowed at base. The tree is sometimes devoid of foliage for many months of the year making it conspicuous in forest areas.

**Distribution**

Kerala

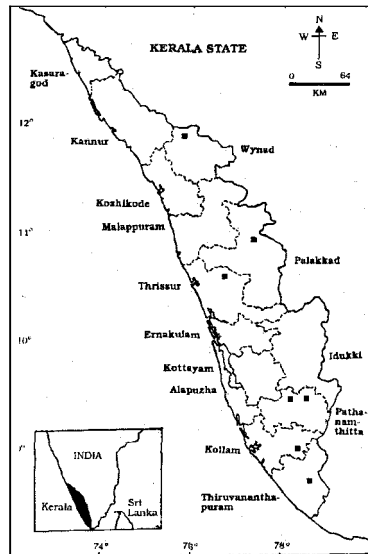
Wynad, Palghat, Trichur, Idukki, Pathanamthitta, Quilon and Trivandrum districts; almost throughout the State, mainly in the highlands (Map 16).

World

Peninsular India, Sri Lanka, Pegu, Africa, Australia.

**Products and uses**

Bark as such, bark fibre, gum from the bark and seeds are extracted from the tree. The bark is dried, softened and used as bed which is curative for rheu-



Kerala

111

tracted by removing large pieces of the bark, soaking them in water and beating for loosening the fibres. The fibre is used to make sacs, garments, cordage and in mat weaving. Therefore, the tree is also known as ‘sacktree’ (Krishnamurthy, 1993).

The brown, resinous gum extracted from the tree by making incissions on the bark is medicinal as a cardiac, circulatory, intestinal stimulant and against uterine contractions. The bitter seeds are medicinal as febrifuge and to arrest dysentery. The fresh, milky sap of the tree is also used to poison arrows. The wood is suitable for making packing cases, match boxes, splints and paper pulp (Anonymous, 1985).

**References cited**

Anonymous, 1985. *The Wealth of India: Raw Materials*. vol. 1: A. CSIR, New Delhi. pp. 309-311.

Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi. p. 379.

**16. APHANAMIXIS POLYSTACHYA (WALL.) PARKER**  
(Meliaceae)

**Nomenclature**

*Aphanamixis polystachya* (Wall.)Parker, Indian For. 57: 486. 1931; Krishnam., Min. For. Prod. India 290. 1993.

*Aglaia polystachya* Wall., Roxb. Fl. Indica 2: 429. 1824.

*Amoora rohituka* (Roxb.) Wt. et Arn., Prodr. 119. 1834; Bedd., Fl. Sylvat. South. India t. 132. 1871; Hiren in Hook.f., Fl. Brit. India 1: 559. 1875; Bourd., For. Trees Trav. 77. 1908; Rama Rao, Fl. Pl. Trav. 75. 1914; Gamble, Fl. Presid. Madras 1: 181. 1915.

**Local name(s)**

Chemnaram, Karagil, Malampuvam.

**Description**

**Trees**, 5-10 m high; **trunk** straight with drooping, smooth branches and thin bark; **branchlets** fine-silky. **Leaves** alternate, imparipinnate, 20-65 cm long, spreading; **rachis** 16-40 cm long, cylindrical, thickened at base; **leaflets** 8-16 pairs with the terminal smallest one 6-12 x 3.5-6 cm, glabrous, lanceolate or oblong, unequal at base, obtuse or acuminate at apex; **petioulules** upto 0.8 cm long, thick, grooved or concave. **Flowers** yellowish-white, sessile or subsessile, polygamous, sparse, on spreading or drooping supra-axillary panicles of spikes; **male flowers** numerous, small; **female flowers** larger than the male, produced on drooping spikes; **calyx** tubular with sepals upto 0.4 cm long, rotundate, downy, ciliate; **corolla** of 3 petals, each upto 0.4 cm long, orbicular; **stamens** 6 or 7, with the staminal tube upto 0.4 cm long and anthers upto 0.2 cm long, almost included in the staminal tube; **pistil** with 3-loculed ovary upto 0.2 cm long, ovoid and villous with one or two ovules and sessile, trigonous stigma. **Capsules** red or yellowish, upto 3.5 cm long, globose to pyriform, smooth, thick, fleshy and valved; **seeds** 2 or 3, purplish-brown, broadly-ovoid, yellow-arillate, apiculate, smooth, shining, marked with raised fibrous raphe along the ventral side.

**Ecology**

Evergreen trees of moderate height, rather common in the moist deciduous and semi-evergreen forests of Kerala. The tree flowers during January-February and fruits ripen by May-June.

**Distribution**

**Kerala**

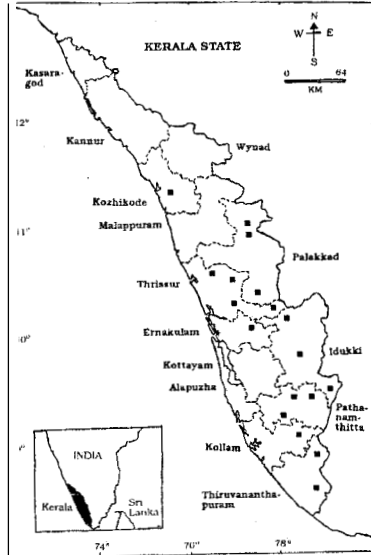
Calicut, Palghat, Trichur, Ernakulam, Idukki, Pathanamthitta, Quilon and Trivandrum districts; almost throughout the State, in the mid and highlands (Map 17).

**World**

India, Sri Lanka, Malesia.

**Notes**

As evident from the nomenclature of the species, the oldest name of the plant is *Aglaiapolystachya* Wall. In the genus *Amoora*, the name is *Amoora polystachya* (Wall.) Hook.f. & Jack., therefore, takes precedence over *Amoora rohituka* Wt. et Arn. Under the genus *Aphanamixis* Bl. also, same is the case as explained by Parker (1931) and therefore the name *Aphanamixis polystachya* becomes valid.



Map 17. Distribution of *Aphanamixis polystachya* (Wall.) Parker in Kerala.

**Products and uses**

Seeds and bark of the tree are extracted for medicinal use. The seeds possess anthelmintic and laxative properties and are also used for curing muscular pains and ulcers. The seed kernels yield 45-50% of a reddish-brown oil which is used in the treatment of rheumatism and also in soap industry and as a burning oil. The oil possesses antifungal activities also (Bhatt and Saxena, 1980). The seeds are also refrigerant, laxative and anthelmintic. The bark of the tree is an astringent, used for the treatment of enlarged glands like liver and spleen. The timber of the tree is also used to make dugouts, canoes, furniture, packing cases, cigar boxes, etc. (Anonymous, 1985) and also in small constructions.

**Regeneration**

The tree, which grows in moist and shaded localities in the forests, is more common along the banks of hill-streams. It regenerates well around the mother trees in natural conditions.

For artificial regeneration, seeds can be collected from ripened fruits, during May-June. When ripened, the fruits split open and expose the deep, orange-coloured seeds. On an average, 1940 seeds weigh one kilogram (FRI, 1981). Due to the oil content of seeds, they perish very soon. Seedlings

raised in nursery and outplanted survive better in shaded locations with sufficient soil moisture conditions.

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- FRI, 1981. *Troup's Silviculture of Indian Trees*. vol. 3. Controller of Publications, Delhi. pp. 145-147.
- Parker, R.N. 1931. Name changes in important Indian trees. *Indian For.* 57: 486.

## 17. ARISTOLOCHIA INDICA L. ( Aristolochiaceae )

### Nomenclature

*Aristolochia indica* L., Sp. Pl. 960. 1753; Wt., Ic. Pl. Ind. Orient. t. 1858. 1852; Hook.f. in Hook.f., Fl. Brit. India 5: 75. 1886; Rama Rao, Fl. Pl. Trav. 336. 1914; Gamble, Fl. Presid. Madras 2: 1202. 1925. Nicol. *et al.*, Intrap. Hort. Malab. 60. 1968; Krishnam., Min. For. Prod. India 27.1993.

*Aristolochia lanceolata* Wt., Ic. Pl. Ind. Orient. t. 1858. 1852.

### Local name(s)

Eshwara-mulla, Garudakodi, Karalakam, Karal-vekam, Karenda-valli.

### Description

Climbing, perennial **herbs** or **undershrubs**, 1-1.5 m high; **branchlets** slender, twining, grooved, glabrous. **Leaves** simple, alternate, variable, 6-9.5 x 2-3.5 cm, ovate-oblong to lanceolate or subcordate, 3-nerved from base, entire with undulate margins, rounded, truncate or subcordate at base, acute at apex; **petioles** 1.5-2 cm long, slender, glabrous. **Flowers** deep-purple or greenish-yellow, upto 3.5 cm long, solitary or in few-flowered axillary racemes; **pedicels** upto 1 cm long, thin below, thickened above; **perianth** 2-2.5 cm long, tubular with globose, inflated base bent at right angle and narrowed into a tube with oblique trumpet-shaped mouth gradually passing into long, narrow, linear-oblong, obtuse, brownish lip; **stamens** 6 with oblong anthers; **pistil** with 6-loculed ovary (rarely 4 or 5 loculed) and short, thick stylar column divided into 6 obtuse or linear, short, erect, stigmatic lobes. **Capsules** upto 2.5-1.5 cm, oblong, 6-valved, truncate, with the pedicels splitting into 6 filaments; **seeds** many, upto 0.5 cm long, deltoid-ovate or oblong, flat, acute at apex, winged along the margins.



**Ecology**

Stragglers or twiners, rather rare in the moist deciduous and semi-evergreen forests of Kerala, often associated with hedge plants, bushes or such other low supports. The plant is also rather common in plains, scrub jungles, wastelands, etc. It flowers mostly during September to November and fruits mature by March, which split open releasing the seeds and empty capsules continue to be on the plant for some more time.

**Distribution**

**Kerala**

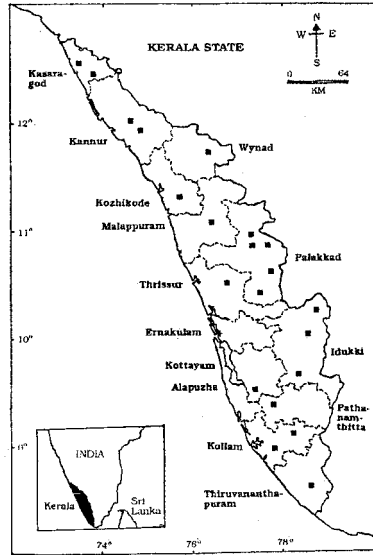
Kasaragod, Cannanore, Wynad, Calicut, Malappuram, Palghat, Trichur, Idukki, Kottayam, Pathanamthitta, Quilon and Trivandrum districts; almost throughout the State, mainly in the mid and highlands (Map 18).

**World**

India, Bangladesh, Sri Lanka.

**Products and uses**

Almost all parts, and especially the leaves and roots of the plant are extensively extracted from forests for medicinal use, mainly due to the presence of aristolochic acid in those parts. The roots and leaf-juice of the plant have been reported as antidote for snake and insect poisons, apart from their therapeutic value in the treatment of cholera, diarrhoea, leucoderma, etc. The dried roots constitute an important drug (Anonymous, 1985) as gastric stimulant and bitter tonic. Based on chemical trials on mouse, Prakash and Prakash (1979) have reported that the plant as a whole, and especially its roots, possesses antifertility properties and is known to be used by tribals as an abortifacient. Parts of the plant are also used in several medicinal preparations to cure physiological disorders and also as a nerve stimulant.



Map 18. Distribution of *Aristolochia indica* L. in Kerala.

**Production and marketing**

The medicinal roots of the plant is extracted from the natural the forest areas of Kerala and marketed through the Kerala State SC & ST Federation (1998) and also other hill produce shops. During 1994-95 to 1996-97, the Federation could procure only about 151 kg of the dried roots, at the cost of about Rs. 5.00per kilogram. In fact, there is no data available on the quantity of the item that was sold through other marketing agencies or persons involved in

drug products sale. Also, the export and import details of the forest produce are lacking (Shiva, *et al.* 1996).

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- Shiva, M.P., Saritha Aswal, Abha Sharma, Pravin Mathur and Rakesh Chandra 1996. *Trends of Export and Import of Minor Forest Products in India.* Centre for Minor Forest Products, Dehra Dun. 38 p.

## 18. ASPARAGUS RACEMOSUS WILLD. (Asparagaceae)

### Nomenclature

*Asparagus racemosus* Willd., Sp. Pl. 2: 152. 1799; Wt., Ic. Pl. Ind. Orient. t. 2056. 1853; Hook. f. in Hook. f., Fl. Brit. India 6: 316. 1892; Rama Rao, Fl. Pl. Trav. 412. 1914; Gamble, Fl. Presid. Madras 3: 1517. 1928; Nicol. *et al.*, Intrap. Hort. Malab. 295. 1988; Krishnam., Min. For. Prod. India 29, 181. 1993.

### Local name(s)

Shathavari.

### Description

Armed, shrubaceous **stragglers**, 3-5 m high with tuberous, slender, cylindrical roots, 30-40 x 1-1.5 cm in size; **main stem** pale yellow when mature, spinous, much branched; **spines** 0.3-0.8 cm long, straight or subrecurved. **Leaves** very minute, scaly, bearing in their axils tufts of cladodes. **Cladodes** 2-6 in a bunch, 0.5-1.5 x 0.2-0.3 cm, acicular and broad in the middle, triquetrous, falcate, acuminate at base and apex. **Flowers** dull white, fragrant, in 2-5 cm long, axillary racemes, solitary or fascicled; **pedicels** upto 0.3 cm long, slender, jointed at or above the middle; **perianth** upto 0.2 cm across, segmented, oblong, obtuse; **stamens** 6 with subulate filaments and purplish, upto 0.2 cm long shortly-oblong or subglobose anthers; **pistil** with 3-loculed, 6-ovuled, obovoid ovary, very short, terminal style and 3, spreading, recurved stigmas. **Berries** red when ripe, upto 0.6 cm in diameter, globose or didymous, 1-2 seeded; **seeds** 3-6, upto 0.2 cm long, globose or angled.

## Ecology

Slender, straggling undershrubs with wiry, yellowish stem and falcate, green, leaf-like cladodes; common along hedges, in scrubjungles and waste places, as undergrowth in plantation, etc. in the moist and dry deciduous forest tracts of Kerala. The plant flowers during August to November and by January-February the green fruits ripen and turn red.

## Distribution

### Kerala

Cannanore, Wynad, Calicut, Malappuram, Palghat, Trichur, Ernakulam, Idukki, Kottayam, Pathanamthitta, Quilon and Trivandrum districts; almost throughout the State, in the mid and highlands (Map 19).

### World

Peninsular India, South Malayasia, South China.

## Products and uses

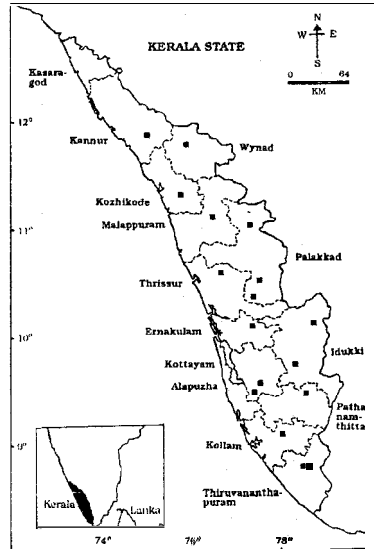
The tuberous roots of the plant are extracted from forests and used extensively in various medicinal and tonic preparations, and are also edible as such. In nervine tonics and aphrodisiac preparations this drug is used in large quantities (Krishnamurthy, 1993). Medicated oil is also prepared from the roots of the plant along with other ingredients. The roots are also sometimes used as vegetable. The plant is also grown as an ornamental.

## Production and marketing

Tuberous roots of the plant are extracted and marketed from the natural forest areas of Kerala. During 1994-95 to 1996-97, about 14,402 kg of the item was handled by the Kerala State SC & ST Federation (1998) at a purchase value of Rs. 4.30 and selling price of Rs. 5.00 per kilogram. Export and import details of the item are not known (Shiva, *et al.* 1996).

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- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi. p. 29.



Map 19. Distribution of *Asparagus racemosus* Willd. in Kerala.

Shiva, M.P., Saritha Aswal, Abha Sharma, Pravin Mathur and Rakesh Chandra 1996. *Trends of Export and Import of Minor Forest Products in India*. Centre for Minor Forest Products, Dehra Dun. 38 p.

**19. BALIOSPERMUM SOLANIFOLIUM (J. BRUM.) SURESH**  
**(Euphorbiaceae)**

**Nomenclature**

*Baliospermum solanifolium* (J. Burm.) Suresh in Nicol., Suresh *et* Manil., Intrap. Rheed Hort. Malab. 106. 1988.

*Croton solanifolius* J. Burm., Fl. Malab. 6. 1769.

*Baliospermum montanum* (Willd.) Muell.-Arg. in DC., Prodr. 15(2): 1125. 1866; Gamble, Fl. Presid. Madras 2: 1342. 1925; Airy Shaw, Kew Bull. 26(2): 222. 1972; Krishnam., Min. For. Prod. India 291-292. 1993.

*Jatropha montana* Willd., Sp. Pl. 4: 563. 1805.

*Baliospermum axillare* Bl., Bijdr. 604. 1826; Hook. f. in Hook. f., Fl. Brit. India 5: 461. 1887; Rama Rao, Fl. Pl. Trav. 373. 1914.

*B. polyandrum* Wt., Ic. Pl. Ind. Orient. t. 1885. 1852.

**Local name(s)**

Naga-danti, Danti-moola, Damika, Kadalavanakku, Nervealom, Niratti-muthu.

**Description**

**Shrubs** or **undershrubs** with stout stem and branches. **Leaves** simple, alternate, coarsely toothed or 3-5 lobed, variable in size and shape, ovate-oblong to lanceolate, scabrous, acuminate at apex; **petioles** 10-17 cm long with a pair of stipular glands at base. **Flowers** pale yellow or greenish in axillary fascicles or racemes; **tepals** of 5, pubescent, about 0.1 cm broad, orbicular lobes; **male flowers** with numerous stamens attached to a central receptacle; **female flowers** in terminal spikes with 5 tepal lobes, lanceolate and accrescent in fruit; **pistil** with 3-loculed and 3-ovuled ovary, 3 styles and bifid stigma. **Capsules** 3 lobed, obovoid, crustaceous, separating into 3 cocci; **seeds** ovoid. smooth.

**Ecology**

Common in deciduous forests and forest margins. Due to uncontrolled exploitation, this species may find its place in the list of endangered plants within a very short period. Flowering and fruiting of the plant is mostly during November to February.

**Distribution**

Kerala

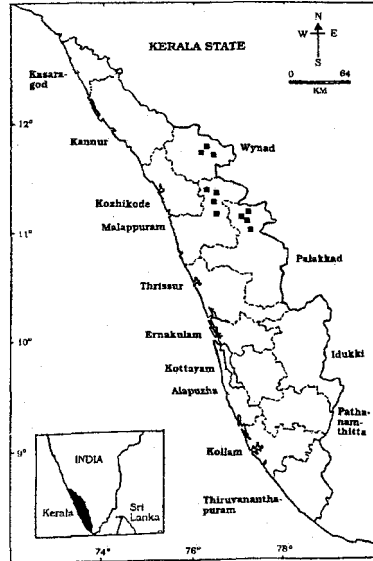
Cannanore, Calicut, Malappuram and Palghat districts (Map 20).

## World

India, Indo-china, Indonesia.

## Products and uses

The major useful parts of the plant are roots and seeds. The roots are collected almost through out the year and are used as a medicine after drying. Oven-dried and powdered roots is the crude drug form available in the market, sold as 'Dantimoola'. It is cathartic and is often adulterated either with the roots of *Jatropha curcas* L. or *Ricinus communis* L. The drug also forms an important constituent of several Ayurvedic preparations. The ethanolic extract of the roots contain 5 phorbol esters. Medicinally, the root is purgative, anthelmintic, carminative, rubefacient and anodyne and is used to cure abdominal pain, constipation, calculus, general anasarca, piles, helminthic-manifestation, scabies, skin diseases, suppurative ulcers and several other diseases caused by morbidity of 'Kapha and Pitha' (Anonymous, 1988).



Map 20 Distribution *Baliospermum solanifolium* (J. Burm.) Suresh in Kerala

The seeds of the plant yield an oil with minor components of hydroxyfatty acid, alliarenic acid, etc. It is externally applied to cure rheumatism and is also consumed as a purgative (Krishnamurthy, 1993). The powdered seeds is also a drastic purgative, one seed being the dose for an adult person. Externally, the seeds are used as a stimulant and rubefacient and also in snake-bite.

The presence of steroids, terpenoids and flavonoids are reported from the leaves of the plant. The leaves also possess purgative properties and are also used for dropsy. They are also used for poulticing wounds and a decoction or infusion of leaves is consumed to check asthma. The plant is also reported to be used in the treatment of abdominal tumors and cancer.

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**20. BAMBUSA BAMBOOS (L.) VOSS**  
(Bambusaceae)

**Nomenclature**

*Bambusa bambos* (L.) Voss, Besch. Pflanzen deu. Gaertn. 2. 1896; Benn. et Gaur, Thirty Seven Bamb. 19. 1990; Tew., Monogr. Bamb. 33. fig. 1-5. 1992; Dransfl. et Widjaja, Prosea 7 (Bamboos): 56-60, fig. 1995.

*Arundo bambos* L., Sp. Pl. 81. 1753.

*Bambos arundinacea* Retz., Obs. 5: 24. 1789.

*Bambusa arundinacea* (Retz.) Willd., Sp. Pl. 2: 245. 1797; Gamble, Ann. Roy. bot. Gardn. Calcutta 7: 51. 1896 & in Hook. f., Fl. Brit. India 7: 395. 1897; Bourd., For Trees Trav. 398. 1908; Rama Rao, Fl. Pl. Trav. 447. 1914; Fisch. in Gamble, Fl. Presid. Madras 3: 1859. 1934; Varm. et Bah., Indian For. Rec. (n.s.) 6(1): 2. 1980; Krishnam., Min. For. Prod. India 182, 192, 472. 1993.

*Bambusa spinosa* Roxb., Hort. Beng. 25. 1814 (*nom. nud.*) Fl. Indica 2: 198. 1832.

**Local name(s)**

Illi, Moongil, Mula.

**Description**

Armed, densely tufted bamboos, 10-25 m high; **culms** upto 15 cm in diameter, nodes slightly swollen with aerial roots towards the base and internodes 20-35 cm long; **branchlets** with recurved spines, often three of them together; **culm-sheaths** yellow, upto 30 x 25 cm, coriaceous, glabrous to pubescent; **ligules** continuous with sheath tip, fringed along margins, white-ciliate. **Leaves** upto 20 x 2.5 cm, lanceolate-linear, entire, glabrous above scabrous with marginal and scattered hairs towards base, puberulous beneath, acute at apex ending in a sharp point; **leaf-sheaths** ligulate, pubescent; **petioles** very short. **Flowers** (spikelets) in compound panicles, upto 2.5 x 0.4 cm, lanceolate, sessile, glabrous except for the ciliate edges of the palea, acute at apex; **glumes** 2, 1 or no empty ones, 3-7 flowered, the lower ones hermaphrodite, upper ones male, with 1-3 terminal imperfect flowers; **palea** 2-keeled, ciliate along the keels; **stamens** 6, exerted and drooping with slender filaments and yellow anthers; **pistil** with



Fig. 10. *Bambusa bambos* (L.) Voss

elliptic-oblong ovary, short style and plumose stigma. **Caryopsis** upto 0.7 cm long, oblong, grooved on one side, ending in a short styler beak, surrounded by persistent glume and palea (Fig. 10).

### Ecology

Rather the most common bamboo species of Kerala, distributed in moist and dry deciduous forests and also in homesteads and wastelands. It is also grown along hedges and boundaries of homesteads and other private holdings in the plains. Gregarious flowering of this bamboo has been reported in 1866, 1896, 1912, 1915, etc. from different parts of Kerala (Tewari, 1992) and the flowering cycle reported is much varying (10-49 years). Rama Rao (1914) and Ramachandran and Nair (1988) reported the flowering months of this species as February-March and Vajravelu (1990) mentions that flowering and fruiting of this bamboo are between August and March. After flowering the culms die-out

### Distribution

#### Kerala

Kasaragod, Cannanore, Wynad, Calicut, Malappuram, Palghat, Trichur, Ernakulam, Kottayam, Idukki, Pathanamthitta, Quilon and Trivandrum districts; almost throughout the State in mid to highlands (Map 21).

#### World

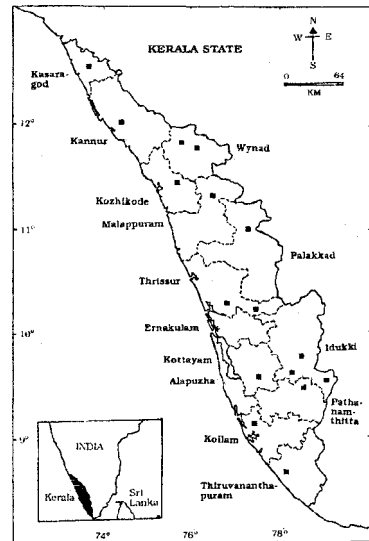
Native of India to southern China, Thailand and Indio-China, cultivated throughout the tropics, especially in East Java, Singapore, Peninsular Malayasia, Thailand and the Philip-pines.

### Notes

It is the typical variety of the species that is commonly found in Kerala and the var. *gigantea* Benn. et Gaur is rather rare (Bahadur and Jain, 1981), found near Chittoor dam, Attappady, Palghat district and also grown now in other parts of Kerala.

### Products and uses

The culms of this bamboo are extensively used as rafters, house-posts, ladders, shafts, in mat and basket making, scaffoldings, chicks, etc. and in the manufacture of bambooply. Various cutting and piercing implements are



Map 21. Distribution of *Bambusa bambos* (L.) Voss in Kerala.

also made of this bamboo, like knives, sharpners, arrow-heads and bows, etc. In sericulture, trays made of this bamboo are also often used.

The grains of *B. bambos* are collected and made into edible flour and cakes and rhizomes and very young and emerging shoots are either pickled or eaten as a substitute for any starchy food material (Krishnamurthy, 1993). They contain a small quantity of bitter or astringent constituent. To remove such constituents, they are cut into small pieces and boiled in water for about 10 minutes and the pieces are salted and kept for about a week when a sour taste is developed making it suitable for pickling.

Medicinally, young shoots are made into poultice (Rama Rao, 1914) for effective removal of worms from ulcers and the bark of the bamboo is also an antidote to poison. The siliceous concretion of the nodal joints of this bamboo (female) is also used as a sweet, cooling, tonic against cough and asthma, and as an aphrodisiac (Rama Rao, 1914). Stems, leaves and roots of this bamboo are also reported (Anonymous, 1988) to be medicinal.

A waxy substance with low melting point obtained from *B. bambos* is used as a base material for the manufacture of shoe polish, carbon paper, water-proof papers, etc. (Anonymous, 1988).

### **Production and marketing**

The productivity of this bamboo species varies considerably in natural forests and plantations. In the case of natural forests, biotic interferences play an important role in the overall productivity and also culm size. Uniform culm-size with 30-50 culms per clump is the ideal condition, which yeild 0.2 to 0.4 tonnes of the bamboo per hectare (Anonymous, 1985). Inplantations, this may go upto 7.5 tonnes per hectare, if managed properly. There is no data in record on the total quantity of this bamboo extracted from the natural forests of Kerala and the Kerala State SC & ST Federation (1998) is not dealing with this item as a non-wood forest produce. However, about 1.6, 1.4 and 4.8 millions of bamboo poles were extracted from the natural forests of the State during 1994-95, 1995-96, 1996-97, respectively (KFD, 1995, 1996, 1997).

### **Regeneration**

The bamboo profusely regenerates naturally from seeds soon after gregarious flowering. However, the flowering cycle reported is 30-35 and 44-49 years (Seethalakshmi and Muktesh Kumar, 1998). No dormancy has been reported for the dispersed seeds and fire and grazing play a negative role in the natural regeneration of the species.



For artificial regeneration, seeds gathered by clearing and sweeping the ground below the flowered clumps, can be sown in nursery beds during March to May. In one kilogram there will be 75,000-105000 seeds (Sen gupta, 1936) and the germination percentage is around 90-100% (Luna, 1996). From one kilogram of seeds, about 55000 seedlings can be produced (Luna, 1996). The seeds are broadcast sown in nursery beds and watered daily for a week and later, on alternate or once in three days. Partial shading of nursery beds can improve the establishment and growth of seedlings (Chacko and Jayaraman, 1990). Large container-raised and fertilized seedlings grow better. Offsets (Adarsh Kumar, 1992), rooted cuttings and tissue-culture plants can also be used for the regeneration of the species (Seethalakshmi and Muktesh Kumar, 1998). Growth rate of culms varies depending on the area of planting, which also affect the length of the internode portion.

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**21. BOMBAX CEIBA L.**  
(Bombacaceae)

**Nomenclature**

*Bombax ceiba* L., Sp. Pl. 511. 1753; Roby., Taxon 10: 160. 1961 & in Bull. Jard. Bot. Brux. 83: 88, t. 3. 1963; Nayar et Biswas in Sharma et Sanjapp. (ed.) Fl. India 3: 398. fig. 111. 1993; Krishnam., Min. For. Prod. India 292. 1993.

*Bombax malabaricum* DC., Prodr. 1: 479. 1824; Wt., Ill. Ind. Bot. 29. 1840; Mast. in Hook.f., Fl. Brit. India 1: 349. 1874; Bourd., For. Trees Trav. 44. 1908; Rama Rao, Fl. Pl. Trav. 45. 1914; Dunn in Gamble, Fl. Presid. Madras 1: 99. 1915.

*Salamalia malabarica* (DC.) Schott in Schott et Endl., Melet. Bot. 35. 1832.

*Gossampinus malabaricus* (DC.) Merr., Lingn. Sci. J. 5: 126. 1927.

**Local name(s)**

Ilavu, Mocha, Mulliapoola, Mullilavu.

**Description**

Deciduous, armed **trees**, 25-40 m high; **trunk** straight, often buttressed with conical, woody prickles; **branches** in whorls of 3 to 5, spreading horizontally, prickled. **Leaves** alternate, digitately compound, 5-9 foliate; **leaflets** 10-22 x 6-9.5 cm, lanceolate to elliptic, entire, glossy above, minutely puberulous or glabrous beneath, tapering at base, caudate or acuminate at apex; **petiolules** 2-2.5 cm long, greenish. **Flowers** bright red or white, showy, solitary or in clusters towards the tip of leafless branchlets, 8-11 cm long; **pedicels** 1-2 cm long, thick, glabrous or tufted puberulous; **calyx** campanulate, irregularly 2-5 lobed, with lobes upto 4 x 3 cm, coriaceous, glabrous or sparsely puberulous outside, silky inside, deciduous; **corolla** with 5 petals, each upto 17 x 4.5 cm, obovate to elliptic-oblong, recurved, fleshy, tomentellous outside, imbricate; **stamens** 65-80, upto 7 cm long, in six bundles in two series and short staminal tube, flat filaments and uniform anthers; **pistil** with conical ovary, style upto 5.5 cm long and 5-fid stigma with spreading lobes. **Capsules** upto 17 cm long, oblong to ovoid, cuneate at

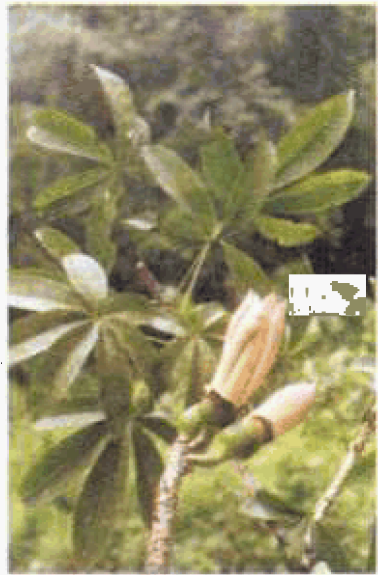


Fig. 11. *Bombax ceiba* L.

both ends 5-valved with the valves silky inside; **seeds** dark brown, pyriform, embedded in white-silky fibres (Fig. 11).

**Ecology**

Prominent trees in moist deciduous and semievergreen forests, especially when in bloom; also grown in homesteads and avenues. Flowers during February-March and fruits ripen by April-May.

**Distribution**

Kerala

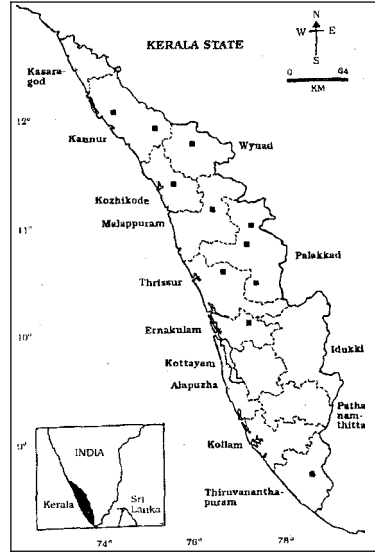
Cannanore, Wynad, Calicut, Malappuram, Palghat, Trichur, Ernakulam and Trivandrum districts; almost throughout the State, mainly in the midlands and hilly uplands (Map 22).

World

India.

**Products and uses**

Silk-cotton produced in the fruits of the tree is very similar to true Kapok yielded by *Ceiba pentandra* (from Java) and is used extensively for stuffing beds, pillows, quilts and in the making of life-belts.



Map 22. Distribution of *Bombax ceiba* L. in Kerala

The roots of *Bombax ceiba* are reported to possess stimulant, tonic aphrodisiac, demulcent properties (Anonymous, 1988) and are specifically used as tonic in male impotency (Nayar & Biswas, 1993). The roots are also powdered and eaten or taken along with milk. The Semul gum exuded from the trunk is also noted to be medicinal for curing dysentery and diarrhoea by local people under the name Mocharas. The bark of the tree is the source of the hog gum which is also fibrous, suitable for cordage. The light wood of the tree, durable in wet-conditions is used in the making of sea-boats, apart from its use as plywood, matchwood and splinters. The wood is also used in the manufacture of pencils and to make musical instruments, toys, brush handles, and several such light-wood items. Fine shavings of wood, known as wood-wool, comparable to that of *Abies* spp. is reputed for panelling and for making cement bonded wood-wool (Anonymous, 1988).

The seeds of *B. ceiba* readily eaten by cattle, are also the source of an yellow oil. The oil is edible and forms a substitute for cotton seed oil in the manu-

facture of soap (Krishnamurthy, 1993). The oil content of the seed is about 20% and the oil-cake makes excellent cattle feed. The flowers, young roots and tender bark are also reported to be edible (Krishnamurthy, 1993).

### **Production and marketing**

A tree at the full fruit bearing age yeild 4-7 kg of cleaned floss. Depending upon the use, the product is also graded into three quality classes. While there is no information available on the total production and marketing details of the item with the Kerala State SC & ST Federation (1998), during 1980-81, about 1232kg of Indian Kapok worth Rs. 1,04,595, was exported (Anonymous, 1988) to countries like Germany and United Kingdom. From Bangladesh, about 34,922 kg of the cotton was also imported to India at the cost of Rs. 90,792 during 1974-75 and similar figures are also available for the import of the item for previous years (Anonymous, 1988).

### **Regeneration**

A strong light demanding and fire-hardy species, *B. ceiba* can also withstand slight frost and draught conditions. Natural regeneration of the species, especially in alluvial soils, savannahs and open forest areas, is common by wind dispersed seeds. Also, injured roots of the tree produce root-suckers.

Seeds for artificial regeneration of the plant will be available from mid April to mid May and ripened capsules are knocked off and seeds and floss separated by sun-drying. Seed weight varies from 21,400 to 38,500 per kilogram and germination percentage vary from 14-75 (FRI, 1981), depending on the locality. Seeds can also be stored in sealed tins for one or two years with slight loss of viability, whereas, when stored in gunny bags, viability is almost completely lost within two years (Luna, 1996). Pre-treatments with cold and hot water is not very useful in this regard. Sowing seeds directly on beds, about 5 cm apart, in lines with about 23 cm gap during May is the usual nursery practice (FRI, 1981). Germination percentage reported is about 60, which will be completed within two months (Luna, 1996). Entire or stump planting of seedlings is done after a year of growth in the nursery. Direct sowing of seeds is also done for the artificial regeneration of the species. However, planting of 1-2years old stumps is the better method among others (Kadambi and Dabral, 1955). Luna (1996) had given a detailed account on the management of *B. ceiba* plantations, including tree-improvement programmes tried for the species.

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## 22. BOSWELLIA SERRATA ROXB. EX COLEBR.

### Nomenclature

*Boswellia serrata* Roxb. ex Colebr., *Asiat. Res. S:* 379.t.5.1807; Benn. in Hook.f., *Fl. Brit. India* 1:528. 1875; Rama Rao, *Fl. Pl. Trav.* 60-61. 1903; Gamble, *Fl. Presid. Madras* 1: 120. 1915; Krishnam., *Min. For. Prod. India* 17,33, 254,267,268,271,277,325,471,473. 1993; Chithra *et Henry*, *Fl. India* 4: 432-433.1997.

*Boswellia glabra* Roxb., *Pl. Corom. t.* 207. 1811; Wt. *et Arn.*, *Prodr.* 174. 1834; Bedd., *Fl. Sylvat. South. India t.* 174. 1871; Gamble, *Fl. Presid. Madras* 1: 120. 1915.

*Boswellia serrata* Roxb. var. *glabra* (Roxb.) Benn. in Hook. f., *Fl. Brit. India* 1:528. 1875.

### Local name(s)

Kungilium, Paranki-sambrani, Vellakunthirikkam, Guggulu, Kunthirikkam, Kunderikka-maram.

### Description

**Trees**, 6-18m high with pubescent branches, swollen at intervals. **Leaves** clustered towards the tips of twigs,



Fig. 12. *Boswellia serrata* Roxb.

imparipinnate, upto 35 cm long with densely tomentose rhachis; **leaflets** subopposite, 10-15 pairs, petioled, variable in shape, oblong to lanceolate, 2-9 x 0.5 - 3.5 cm, subentire or crenate, thin-coriaceous, glabrous above, rusty beneath, cuneate, subacute or suboblique at base, tapering or acute at apex. **Flowers** white or with a pinkish tinge, fragrant, in 10-15 cm long, axillary panicles; **pedicels** solitary or clustered, upto 0.8 cm long; **calyx** tubular, campanulate, upto 0.3 cm long, pubescent; **corolla** with 5-7 petals, each upto 0.6 x 0.4 cm, ovate, saccate at base; **stamens** 10-16, free, inserted below disc, upto 0.3 cm long with oblong anthers; **pistil** with sessile, oval, 3-loculed ovary, grooved style and capitate stigma. **Capsules** trigonous, upto 2 x 1.5 cm with 3 pyrenes, each with one winged seed (Fig. 12).

### Ecology

Stunted trees forming part of the scanty tree flora of the southern tropical dry deciduous and mixed deciduous forests of the State. It is also common in dry teak forests, northern tropical deciduous forests and sal forests, elsewhere in India. Common associates of the tree include *Sterculia urens*, *Anogeissus latifolia*, *Hardwickia binata*, and so on. The trees shed leaves by December and develop new foliage during January and flowering and fruiting takes place after that, i.e. during January to June. The bark of the tree peels off as thin papery flakes.

### Distribution

#### Kerala

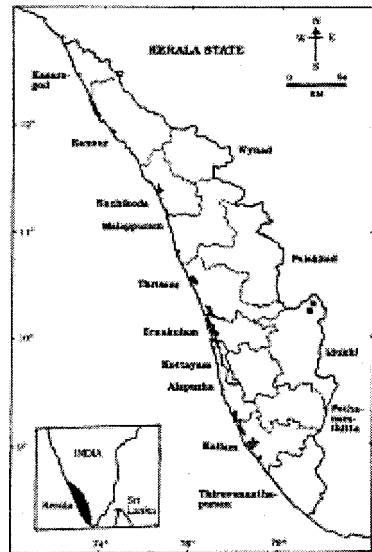
Chinnar and Marayur, Idukki District (Map 23).

#### World

North-West and Peninsular India.

### Products and uses

An oleo-gum-resin is extracted from the trunk of the tree (this angiosperm tree is the only non-conifer source of the product). The product is extracted by tapping the tree trunk with bands of bark, about 30 cm long, 20 cm wide and 0.75 cm thick, removed from an average height of about 15 cm from the base of the trunk. The number of such blazes that can be made on a tree depends mainly on the girth of it. Procedures for selection of trees, season of tapping, sustained extraction of the product and its processing, grading and storage have been documented by Murthy and Siva (1977). The exuded



Map 23 Distribution of *Boswellia serrata* Roxb. ex Colebr in Kerala

oleo-gum-resin material is scarpped off and kept in baskets or slopping cement floor to drain the liquid portion which is mostly an volatile oil used in the preparation of paints and varnishes. The different constituents of the exuded material are volatile oil, resin, gum, insol matter and moisture, which can be separated by steam distillation, solvent extraction or ethnlol extraction methods, as described by Karnik and Sharma (1970). The oil extract, which is similar to turpentine, is a substitute of it and is mainly used in the manufacture of paints, varnishes, soaps and perfumes. The rosin component forms a substitute for Canada balsam and the micro-oil extract is used in microscopy and in the manufacture of soaps, high-class paints, varnishes, lacqures and painting inks (Anonymous, 1988). The gum-rosin fraction of the exudate form an ingredient in the manufacture of incence sticks, in calico printing and in textile industry for sizing and finishing. The gum-rosin is also used in the manufacture of distemper.

Medicinally, the gum exudate of the tree is well known as astringent, stimulent, expectorant, diuretic, diaphoretic, emmenagogue, echolic and antiseptic, in addition to its anti-bacterial and antifungal properties (Anonymous, 1988). Rama Rao (1914) had also reported several local uses of the gum in Kerala, especially in the treatment of sexually transmitted diseases. The gummy wood as such is burnt like a torche during night. The flowers and seeds of the tree are edible and they are also used in flok-medicine. Besides such non-wood products, the timber of the tree is much used for making tea-boxes, platters and as charcol wood, which is also a quality pulpwood used in the manufacture of newsprint and rayon grade pulp.

### Production and marketing

The oleo-gum-resin of *B. setrata*, apart from its domestic consumption, is also exported on a large scale from India. Commercially, the product is called Indian Olibanum or Frankincence, or Guggul Salai in Hindi. During 1977-78 to 1980-81 (Table 4) about 1,100 metric tonnes of Olibanum was exported from India, earning a foreign exchange worth about Rs. 18 million.

Table 4. Details of the oleo-resin export from India during 1977-'78 to 1980-'81 (Anonymous, 1988).

Year	Quantity (Tonnes)	Value (Rs.)
1977-78	166.2	2,661,220
1978-79	444.4	6,518,738
1979-80	235.9	4,127,412
1980-81	261.8	4,271,327
<b>Total</b>	<b>11,08.3</b>	<b>17,578,697</b>

During 1990-91, the export of the product came down to 75.45 tonnes, worth Rs. 3.24 million, as recorded by Shiva (1996) and others. However, the contribution of Kerala State towards the production and marketing of this product is very meagre or absent, as the tree grows only very rarely in the rain-shadow pockets of the State. Therefore, improving the natural population of this indigenous tree species in the State is much desired.

### Regeneration

*B. serrata* is a strong light-demander, fairly frost-hardy and is intolerant to shade. The tree regenerates well by coppice shoots, root suckers and also from seeds. It also pollards well depending on climatic and edaphic factors (Luna, 1996). The new recruits suffer from prolonged draught during October to May, which also recover in many cases.

The tree can be regenerated easily from seeds and branch cuttings. It flowers during February-March and bear fruits by April-May which ripen by the end of May. Ripened seeds can be collected off the trees before the fruits split open. About 14000-15000 seeds weigh one kilogram. The seeds germinate to about 48% and the plant percent is about 20 in nursery conditions (Luna, 1996). Data on the storage capacity of the seeds is not clearly known and fresh seeds are suitable for sowing. Germination will be completed within a fortnight. In fact, raising of seedlings in polythene bags is preferred than nursery beds because of the tender nature of seedlings (Luna, 1996). Nursery raised seedlings, 8-19 weeks old, can be field-planted. Planting of basket or dona raised seedlings and direct sowing are also successful (FRI, 1981). Also, limited soil working before planting will improve the survival percentage of outplanted seedlings. Severe draught conditions and eating away of the roots of seedlings by wild pigs affect the survival of the seedlings to a great extent in natural conditions. Branch cuttings are also commonly used for the artificial regeneration of the species (FRI, 1981) and the major requisites for ensuring success by this method are also available. The cuttings should be from thick shoot ends, 90-120 cm long and 20-25 cm thick, planted in pits of 45-60 cm depth and about 90 cm across, and the best season for planting is April-May. The method of planting with regard to hilly areas, plains and afforestation sites has also been standardised (FRI, 1981). Such plantings are often susceptible to injuries by wind and frost conditions and also from insect pests. Being a slow-growing tree, it attains a diameter of about 9 cm in 10 years and about 30 cm at 65 years of growth.

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### 23. BUTEA MONOSPERMA (LAMK.) TAUB. ( Papilionaceae )

#### Nomenclature

- Butea monosperma* (Lamk.) Taub. in Engl. & Prantl, Nat. Pflanzenfam. 3(3):1894; Sant., Bull. bot. Soc. Bengal 3: 12. 1962; Mahesh., Bull. Bot. Surv. India 3: 92. 1962; Nicol. *et al.*, Intrap. Hort. Malab. 124. 1988; Krishnam., Min. For. Prod. 249, 346, 474, 499, 506, 519. 1993.
- Erythrina monosperma* Lamk., Ency. Meth. Bot. 1:391. 1783.
- Butea frondosa* Koen. *ex* Roxb., Asiat. Res. 3: 469. 1792; Wt. *et* Arn., Prodr. 261. 1834; Bedd., Fl. Ivat. South. India t. 176. 1872; Baker in Hook.f., Fl. Brit. India 2: 194. 1876; Bourd., For. Trees Trav. 115. 1908; Rama Rao, Fl. Pl. Trav. 120. 1914; Gamble, Fl. Presid. Madras 1: 357. 1918; Blatt., J. Indian bot. Soc. 8: 134.

#### Local name(s)

Palasin-samatha, Pu-palasu.

#### Description

Much branched, deciduous, stunted **trees**, 10-15 m high; **branchlets** irregular, tomentose. **Leaves** alternate, pinnately trifoliate, with slender rachis upto 20 cm long, pubescent; **leaflets** terminal 10-22 x 6-10 cm, broadly-ovate, cuneate at base and lateral leaflets 10-15 x 6.5-9.5 cm, midrib shifted to one side, obliquely rounded at base; **petiolules** upto 0.6 cm long, subulate. **Flowers** bright orange-red or salmon-coloured, upto 6 cm long, in upto 40 cm long, axillary or terminal racemes; **pedicels** upto 2.5 cm long, brown-velvety; **calyx** upto 1.5 cm long, dark-olive-green, densely velvety externally, silky-hairy within, with 5 deltoid lobes; **corolla** 4-5 cm long with standard petal almost 5 x 2.5 cm, lanceolate, silky-pubescent. wing petals 5-1.5 cm, falcate and adnate to the keels and keel petals about 7 x 2 cm, incurved, beaked; **stamens** 6, with filaments upto 2 cm in length, united into a thick

staminal column; **pistil** with ovary upto 2.5 cm in length, style about 4 cm long and simple stigma. **Pods** upto 15 x 5 cm, falcate-oblong, pubescent, compressed, argenteo-canescens, long stalked; **seeds** reddish-brown, almost 2 cm long, ovate, smooth.

### Ecology

Medium sized trees, often with crooked trunk, irregular branches and rough and ash-coloured branchlets. The tree is rather common in moist and dry deciduous forest tracts of the State, and rarely in the plains and also along forest borders. The tree bears flowers in February-March and fruits ripen during June-July. When in flowers, the trees are very conspicuous, as they are leafless with showy inflorescence.

### Distribution

#### Kerala

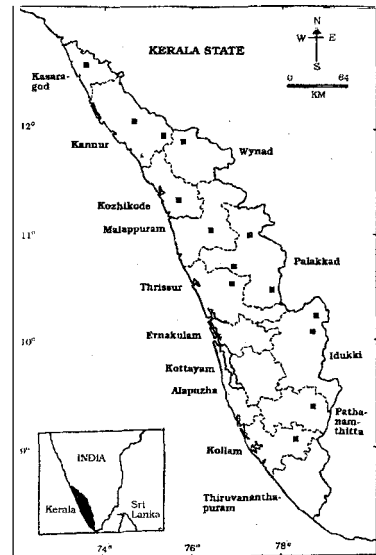
Kasaragod, Cannanore, Wynad, Calicut, Malappuram, Palghat, Trichur, Idukki, Pathanamthitta and Quilon districts; almost throughout the State, mainly in the mid to highlands (Map 24).

#### World

India, Sri Lanka, Myanmar, extending to Malesia.

### Notes

It is the typical variety, ie. var. *monosperma*, as recognised by Maheswari (1961), that occurs in South India, of which the type locality is Malabar (North Kerala). The var. *lutea* (Witt) Mahesh. differs from the typical form in flowers which are yellow or canary yellow and this variety is confined to central and northern parts of India (Maheswari, 1971) and also sometimes grown in gardens.



Map 24. Distribution of *Butea monosperma* (Lamk.) Tauh. in Kerala.

### Products and uses

The bark of *Butea monosperma* trees yields a red gum called the Butea gum or Bengal gum. The tannin and mucilagenous materials in the gum are reported to be a strong astringent and are advocated for different types of chronic diarrhoea. Flowers are also reported (Anonymous, 1988) to possess astringent, depurative, aphrodisiac and tonic properties. The seeds of the tree are also useful in the treatment of worm infections and decoction of the bark is remedial for cold, cough, fever, hemorrhages, etc., which form part of

eral health tonics and elixirs. So also, roots of the tree are used to cure night blindness and other eye defects and in the treatment of elephantiasis. There are also reports that the shoot apex of *Butea monosperma* is used by the 'Kani' tribals of Kerala to prevent conception and that the leaves are used as 'beedi' wrappers (Krishnamurthy, 1993) which are sometimes stiched together and used as food plates (Vajravelu, 1990).

The flowers of the tree yield a brilliant but fugitive, yellow dye used to colour fabrics, woollen carpets, etc. Being non-poisonous, this dye is also used to colour food items and as a substitute for coal-tar dyes. The roots also yield a red dye (Krishnamurthy, 1993).

Seeds of *Butea monosperma* contain 20% of fatty oil called Moodooga oil or Kino tree oil, used in the manufacture of soaps and detergents. The oil-cake is also a rich source of protein. Krishnamurthy (1993) reports that the wood of the tree is suitable for making paper-pulp.

### **Production and marketing**

Flowers and fruits of the tree are the non-wood produces collected and marketed from Kerala, eventhough the bark of tree with gum content is also commercially important. During 1996-97, the Kerala State SC & Federation (1988) received about 1507 kg of the flower and fruit produce from the Federation's network of collection centres in Kerala at a cost of Rs. 19.00 per kg and the Federation sold the item at the rate of Rs. 20.00 per kilogram.

### **Regeneration**

*B. monosperma* is a light demanding and frost resistant tree which can tolerate certain amount of shade. It is also a fire-hardy species (Luna, 1966). It regenerates well from root suckers and has also very high coppicing capacity. The very good pollarding nature of the tree is a favourable factor for the cultivation of lac on it. Trees of 45 to 60 cm girth can be pollarded safely and this can be repeated upto 30 years. Natural regeneration by root-suckers and through seeds dispersal during rainy season is very common and seeds retain their viability in the field even after one year. The seedlings show remarkable recovery from injury in natural conditions which also spread by root suckers (Luna, 1996).

For artificial regeneration, ripened pods containing seeds can be collected during May-June. About 635 pods weigh one kilogram. Pods as such or seeds seperated from them can be stored for about a year (Dent, 1948) without much loss in viability. About 1000-1400 seeds weigh one kilogram and about 75-100% germination of seeds has been recorded (FRI, 1983) with a plant percent of 52-80 (Sengupta, 1937). In the nursery, usually pod-seg-

ments containing seeds are sown in lines during May-June. The seeds are to be sown 15 cm apart and 7.5 cm in between, in 2.5 cm sunken beds. The beds are to be covered by sand and soil and raised to 2.5 cm above ground level after sowing. Germination start by about a week and will be completed within 3 weeks (Luna, 1996). The seedlings so raised will be ready for outplanting during the next rainy season or can be retained in the nursery for one year to transplant them as stumps. However, direct sowing of seeds in the field is reported to be more successful (FRI, 1983) than stump or entire transplant (Kadambi and Dabral, 1955).

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**24. CAESALPINIA BONDOC (L.) ROXB.**  
(Caesalpinaceae)

**Nomenclature**

*Caesalpinia bonduc* (L.) Roxb., Fl. Indica 2: 362. 1832; Dandy *et* Exell, J. Bot. 76: 176. 1938; Hattink, Reinwardtia 9: 17. 1974; Nicol. *et al.*, Intrap. Hort. Malab. 125. 1988. *Guilandinabonduc* L., Sp. Pl. 381. 1753.

*Guilandina bonducella* L., Sp. Pl. ed. 2: 545. 1762.

*Caesalpinia bonducella* (L.) Flem., Asiat. Res. 11 : 159. 1810; Baker in Hook.f., Fl. Brit. India 2: 254. 1878; Rama Rao, Fl. Pl. Trav. 134. 1914; Krishnam., Min. For. Prod. India 33,292,453. 1993.

*Caesalpinia crista* L., Sp. Pl. 380. 1753; Gamble, Fl. Presid. Madras 1: 393. 1919.

**Local name(s)**

Kazhanchi, Kazhanchi-kay, Kazhanji-kuru.

**Description**

Armed, shrubaceous, **stragglers or climbers**, 3-7 m long; **branchlets** reddish-brown or grey downy, yellow-prickly. **Leaves** alternate, biparipinnate, 30-40 cm long, leaflets 6-16 pairs, with a pair of persistent, reduced pinnae at the base; **leaflets** 2-5 x 0.2-0.3 cm, elliptic-oblong, thin, glabrous above, downy beneath, rounded or acute at base, obtuse and mucronate at apex. **Flowers** yellow in terminal, long, peduncled racemes forming lax panicles; **pedicels** upto 1 cm long, finely brown-downy; **calyx** 0.5-1 cm long, with 5, unequal, 0.8-1 x 0.5 cm, oblong-ovate sepals the lower one upto 0.6 cm long, tomentose; **corolla** with the upper petals smaller, 0.8 x 0.4 cm, oblanceolate, subexserted and lateral petals 1.5 x 0.4 cm, obtuse at apex; **stamens** 10, declinate, subequal with filaments attenuate, glandular-villous at base and anthers uniform, dehiscing longitudinally; **pistil** with stipitate, globose ovary with 2 ovules, pubescent style, upto 0.4 mm long and simple stigma, dilated with a ring of hairs around. **Pods** shortly stalked, 3.5-7.5 x 2.5-4 cm, oblong, densely prickly, dehiscent; **seeds** 1 or 2 in a pod, grey or lead coloured, upto 1 cm in diameter, globose.

**Ecology**

Straggling, spiny shrubs or lianas with brown stem, common along the sides of ravines or as climbers on forest trees in disturbed and open areas in the forest outskirts. The plant flowers by August-September and fruits mature during February-March. The fruits are compactly long, slender, spiny throughout, and therefore difficult to collect as such.

**Distribution**

**Kerala**

Cannanore, Malappuram, Trichur, Idukki and Pathanamthittadistricts; mainly from the mid to the highlands. The plant is also reported to be cultivated in the Union Territory of Mahe, near Cannanore (Map 25).

**World**

India, Myanmar, Sri Lanka.

**Notes**

This is the Grey nickar plant, a species with aculeate fruits and globose or subglobose, grey seeds, commonly known as *Caesalpinia bonducella* (L.) Flem., or more recently named as *Caesalpinia crista* L. in literature. *Caesalpinia bonduc*- is the upto date name for the species.

**Products and uses**

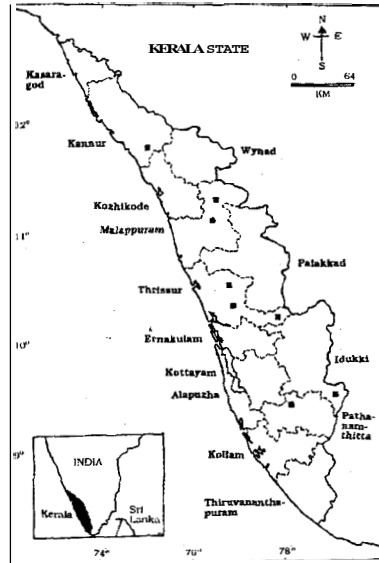
Seeds called Bonduc nut or Fever nut and bark are the parts of the plant, extracted for mostly medicinal purposes. Powdered seeds mixed with black pepper is used as a tonic and febrifuge (Krishnamurthy, 1993) and the bark is also used in tonic preparations. Oil from seeds (about 20%), apart from its medicinal uses, is also a cosmetic (Anonymous, 1950) and illuminant. Root bark is also in the treatment of tumours. The smooth seeds are often used as playing marbles and for making necklaces, bracelets and window curtains.

**Production and marketing**

The medicinal seeds of the plant is the non-wood produce extracted and marketed through the Federation, eventhough details on the actual turnover of the product from the natural forests of Kerala is lacking. However, its market cost fixed by the Kerala State SC & ST Federation (1998) for 1994-95 to 1996-97 was Rs. 15.00 per kilogram.

**References cited**

Anonymous, 1950. *The Wealth of India: Raw Materials.* vol. 2. CSIR, New Delhi. p. 3.  
 Kerala State SC & ST Federation 1998. Different items of LFPP handled during 1994-95 to 1996-97 and price fixed by MFP Committee per kilogram for 1997-98. Trivandrum (unpublished).



Map 25. Distribution of *Caesalpinia bonduc* (L.) Roxb. in Kerala.

Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi. pp. 33-34.

**25. CAESALPINIA SAPPAN L.**  
( **Caesalpinaceae** )

**Nomenclature**

*Caesalpinia sappan* L., Sp. Pl. 381. 1753; Hook.f. in Hook.f., Fl. Brit. India 2: 255. 1878; Bourd., For. Trees Trav. 138. 1908; Rama Rao, Fl. Pl. Trav. 134-35. 1914; Gamble, Fl. Presid. Madras 1: 394. 1919; Nicol. *et al.*, Intrap. Hort. Malab. 126. 1988; Krishnam., Min. For. Prod. India 347. 1993.

**Local name(s)**

Chappangam, Sappannam.

**Description**

**Trees**, stunted or sometimes with straggling branches, upto 15m high; **bark** pale grey; **branchlets** rufous pubescent, prickly. **Leaves** opposite, abruptly bipinnate, 40-70cm long, with 10-13 pairs of pinnae, each 10-15cm long; **rachis** often spiny, glabrescent; **leaflets** 10-20 pairs per pinna, 1.2-1.9 x 1.0-1.5cm, subsessile, unequally elliptic-oblong, minutely puberulous and dotted beneath, obtuse at base, retuse at apex. **Flowers** yellow in axillary or terminal, rusty-pubescent panicles, 30-40 cm long; **pedicels** 1-1.5 cm long; **calyx** 5-lobed, upto 1 cm long, slightly pubescent, leathery; **corolla** upto 2 cm long with subequally orbicular petals, bloched red at base and yellow towards apex; **stamens** 10 with filaments densely wooly towards base and anthers uniform and dehiscing longitudinally; **pistil** with grey-velvety ovary, filiform style and capitate stigma. **Pods** yellowish-green when ripe, 8-10 x 4-5 cm, falcate-oblong, glabrous, thick, flattened, woody, indehiscent, 2-valved, acuminate at apex; **seeds** 2-4 per pod, compressed, smooth (Fig. 13).



Fig. 13. *Caesalpinia sappan* L.

**Ecology**

The tree grows naturally in the moist deciduous forests and is also often

grown along hedges in the non-forest areas of the State. Flowers are produced during March to May, sometimes extending to August and during November-December, the fruits mature.

### Distribution

#### Kerala

Calicut, Trichur and Quilon districts; rarely cultivated elsewhere (Map 26).

#### World

Indigenous to Myanmar, Africa, Philippines and Central America; Cultivated or running wild in South India (Maharashtra, Madhya Pradesh and Orissa southwards).

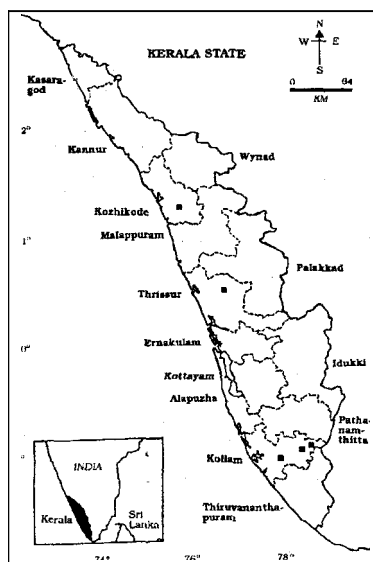
### Products and uses

Coloured heartwood is the useful part extracted from this plant. The wood is yellowish or brownish orange in colour, darkening on exposure and is hard and heavy with a specific gravity of about 1.03 (air dried). It weighs about 880-975 kg/m<sup>3</sup>, and is even grained. The wood is very beautiful and takes fine, lustrous polish and is excellent for inlaying and other decorative purposes, making cabinets, walking sticks and scabbards. However, the wood of *Caesalpinia sappan* is more valued as the source of a red dye, commercially extracted and used for colouring cotton, silk and woolen fabrics, in calico printing and for dyeing coir mats. The dye is extracted by putting chips or powdered wood in water, once or twice (Krisnamurthy, 1993). Powdered wood, known as Abir or Gulal is also used as the colour spray on the occasion of the Holy festival. The bark and pods of the tree also contain orange-yellow or red dye used as a colouring agent for cakes.

Wood decoction is medicinally used as an astringent and also in the treatment of dysentery, diarrhoea and skin diseases. It is also a powerful emmenagogue. The resin extract of wood fused with potash yield resorcin. Locally, decoction or powder of the stem is known as a preventive of abortion, leprosy, insanity and epilepsy. Fruits (pods) of *Caesalpinia sappan* contain about 40% tannin, used for tanning leather. The wood of the plant is also much preferred for making drum-sticks.

### Production and marketing

The dried bark of the plant is procured and marketed by the Kerala State SC



Map 26 Distribution of *Caesalpinia sappan* L in Kerala



& ST Federation (1998) as a non-wood forest produce. The Federation procured the item for Rs. 4.75 per kg and sold it for Rs. 5.00 per kilogram, during 1994-95 to 1996-97. However, there is no quantified data available with the Federation on the annual turn-over of the product. It is worth mentioning here that the more important product of the tree is the heartwood of it used for various non-timber purposes. Both the products are not listed by Shiva, *et al.* (1996) as exported from India.

### Regeneration

This thorny and stunted tree, is suited to dry and rocky areas and as a hedge plant. It regenerates naturally from seeds, coppices and by hardy wood cuttings (Burkill, 1935). Artificially, the plant can be regenerated by seeds. Fruits ripen during winter months and even trees less than two years old, bear flowers and fruits. Seeds collected from ripe pods can be stored with out much loss of viability. One kilogram of seeds contain about 1760 to 2260 numbers (FRI, 1983). Direct sowing or planting of nursery raised or container-seedlings is practised for the artificial regeneration of the plant.

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## 26. CALAMUS BRANDISII BECC. EX BECC. ET HOOK. F. (Palmae)

### Nomenclature

*Calamus brandisii* Becc. ex Becc. et Hook.f. in Hook.f., Fl. Brit. India 6: 448. 1892; Becc., Ann. Roy. bot. Gard. Calcutta 11: 91. t. 102. 1908; Rama Rao, Fl. Pl Trav. 422. 1914; Blatt., Palms Brit. India & Ceylon 315. 1926; Fisch. in Gamble, Fl. Presid. Madras 3: 1567. 1931; Renuka, Ratt. West. Ghats 23. t. 9 (A&B). 1992; Krishnam., Min. For. Prod. India 496, 498. 1993.

### Local

Chooral.

**Description**

Armed, clustering, small-diameter canes; **stems** 10m or more in length, upto 1.5 cm in diameter including sheath. **Leaves** pinnately compound, spirally arranged, sheathed with the laminar portion upto 1 m in length; **petioles** upto 20 cm long, spiny; **sheaths** green, spiny, devoid of ocrea; **spines** 3-4 cm long, bristle-like; **leaflets** upto 22 x 2 cm, linear-lanceolate with prominent midrib. **Flowers** dioecious in axillary, slender, sheathed inflorescence, more than 50 cm long, often branched; **male flowers** with 3 sepals, 3 petals and 6 stamens; **female flowers** with tricarpellary ovary covered with imbricate scales and large, reflexed stigma. **Fruits** brown or dark brown, almost 1.5 x 0.6 cm, ovate, covered with scales, 1 seeded.

**Ecology**

This cane species is rather rare in the evergreen forests of Kerala at medium and high elevations. Flowers by October-November and fruits mature during April-May.

**Distribution**

Kerala

Bonacaud in Trivandrum district (Map 27).

World

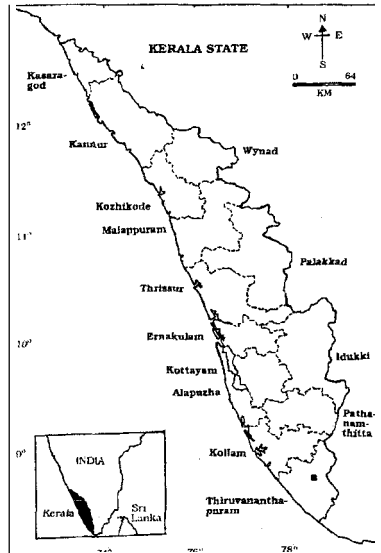
Southern Peninsular India in Kerala and Tamilnadu.

**Products and uses**

A small diameter cane extensively used in the making of furniture and fancy items, known as Tinnevelly cane (Krishnamurthy, 1993) in trade.

**Regeneration**

Natural regeneration of the species is by seeds and also suckers. Seeds ripen and disperse during April to June, which sprout by the onset of first monsoon.



Map 21. Distribution of *Calamus brundisii* Becc. ex Becc. et Hook.f. in Kerala.

Artificially, the cane species can be raised from seeds. Ripened seeds collected from natural stands are removed of their outer scales and fleshy cover by hand, before sowing. Rubbing and washing in water will easily remove the scales and pulpy part. The cleaned seeds are to be sown as early as possible to avoid drying and thereby losing viability (Renuka, 1991). The seeds before sowing may be treated with fungicides to prevent infection. In

the nursery, initially the seeds may be kept in moist saw dust for about two weeks till they start germinating. Germination percentage reported for the seeds of this cane species is around 90. The germinated seeds can be sown in polythene containers, filled with forest top soil and sand, and kept under partial shade. The seeds can also be sown in beds and later pricked out into containers (Renuka, 1991).

The seedlings will be ready for outplanting after a year, by the onset rainy season. In the field, the seedlings can be planted 8 metres apart in lines of 2 metres width. Planting is done after removing the polypots without disturbing the soil around roots. For planting, pits of 25 x 25 x 25 cm are ideal and the root collar of the seedlings shall be at the ground level when outplanted. Mulching and weeding can improve the survival rate and growth of seedlings. The cane species comes up well in altitudes above 1000m above msl.

### References cited

- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi. p. 496.
- Renuka, C. 1991. How to establish a cane plantation. *KFRI Information Bulletin* 10. Kerala Forest Research Institute, Peechi. 7p.

## 27. CALAMUS DRANSFIELDII RENUKA

### Nomenclature

*Calamus dransfieldii* Renuka, Kew Bull. 42: 433. 1987 & in Ratt. West. Ghats 26. t. 10 (figs. 1-6). 1992.

### Local

Chooral.

### Description

Spiny, solitary or clustering, medium-diameter canes; **stems** upto 9 m in length, about 3.5 cm in diameter including sheath. **Leaves** pinnately compound, spirally arranged, sheathed with the laminar portion upto 2 m in length; **petioles** upto 50 cm long, spiny; **sheaths** pale green, scattered spiny, devoid of ocrea; **spines** 0.5-1 cm long, often bulbous-based; **leaflets** about 40 x 2 cm, narrowly-lanceolate or linear-lanceolate with prominent midrib, acuminate at apex. **Flowers** dioecious, in very long (upto 3.5 m), flagellate, branched inflorescence; **male flowers** with 3 sepals, 3 petals and 6 stamens; **female flowers** with tricarpellary ovary covered with scales. **Fruits** shiny yellow, about 1 cm in diameter, globose, deeply grooved in the middle, 1-seeded.

**Ecology**

Very rare climbers in the evergreen and semi-evergreen forests of Kerala, mostly at low elevations. Flowers are produced by November-December and fruits ripen in April-May.

**Distribution**

Kerala

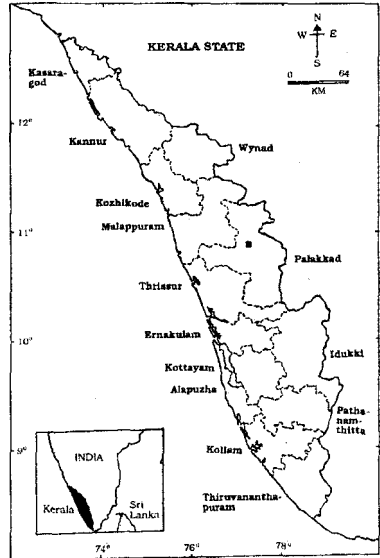
Dhoni near Olavakode in Palghat District (Map 28).

World

Southern Peninsular India in Kerala, Karnataka and Tamilnadu.

**Notes**

A newly described cane species of South India, available only in very small populations, often not discriminated from other rattans by the cane gatherers.



Map 28 Distribution of *Calamus dransfieldii* Renuka in Kerala

**Products and uses**

A medium-diameter cane, used in furniture making and basket weaving (Renuka, 1992).

**Regeneration**

Natural regeneration of the species is by seeds. Seeds ripen and disperse during April to June, which sprout by the onset of first monsoon.

Artificially, the cane species can be raised from seeds. Ripened seeds collected from natural stands are removed of their outer scales and fleshy cover by hand, before sowing. Rubbing and washing in water will easily remove the scales and pulpy part. The cleaned seeds are to be sown as early as possible to avoid drying and thereby losing viability (Renuka, 1991). The seeds before sowing may be treated with fungicides to prevent infection. In the nursery, initially the seeds may be kept in moist saw dust for about two weeks till they start germinating. Germination percentage reported for the seeds of *C. dransfieldii* is around 90. The germinated seeds can be sown in polythene containers, filled with forest top soil and sand, and kept under partial shade.

The seedlings will be ready for outplanting after year, by the onset of rainy season. In the field, the seedlings can be planted 4 metres apart in lines of 2

metres in between. Planting is done after removing the polypots without disturbing the soil around roots. For planting, pits of 25 cm x 25 cm x 25 cm are ideal and the root collar of the seedlings shall be at the ground level when outplanted. Mulching and weeding can improve the survival rate and growth of seedlings. This single stemmed cane comes up well in evergreen and moist deciduous forests at 300 to 900 m elevation.

### References cited

- Renuka, C. 1991. How to establish a cane plantation. KFRZ *Information Bulletin* 10. Kerala Forest Research Institute, Peechi. 7p.
- Renuka, C. 1992. *Rattans of the Western Ghats: A Taxonomic Manual*. KFRI, Peechi. p. 26.

## 28. CALAMUS GAMBLEI BECC. EX BECC. ET HOOK. F. (Palmae)

### Nomenclature

*Calamus gamblei* Becc. ex Becc. et Hook.f. in Hook.f., Fl. Brit. India 6: 693. 1893; Becc., Ann. Roy. bot. Gardn. Calcutta 11:96,316, t. 123. 1908; Rama Rao, Fl. Pl. Trav. 422. 1914; Blatt., Palms Brit. India & Ceylon 322. 1926; Fisch. in Gamble, Fl. Presid. Madras 3: 1568. 1931; Renuka, Ratt. West. Ghats 26. t. 11 (A-C), 1992; Krishnam., Min. For. Prod. India 497, 498. 1993.

### Local name(s)

Ottamoodan, Pacha-chural.

### Description

Spiny, clustering, medium-sized climbing canes; **stem** upto 30 m in length, about 2.5 cm in diameter including sheath. **Leaves** pinnately compound, spirally arranged, sheathed with the laminar portion about 1 m in length; **petioles** upto 20-25 cm in length, spiny; **sheaths** green, spiny, devoid of ocrea; **spines** 0.5- 1.3 cm long, bulbous based, horizontal with the tip slightly bend upwards; **leaflets** upto 40 x 2.3 cm, narrowly lanceolate, with prominent mid-rib, acuminate and bristled at apex and veins ciliate on both sides. **Flowers** dioecious in upto 1 m long branched inflorescence; **male flowers** in



Fig. 14. *Calamus gamblei* Becc. c.r Becc. et Hook.f.  
(Courtesy : C. Renuka).

orderly branched inflorescence with 3 sepals, 3 petals and 6 stamens; female flowers with tricarpeal ovary, covered with scales. Fruit yellow and shiny, upto 2 cm across, globose or slightly tapering at base, scaly, shortly stalked and deeply grooved, 1-seeded (Fig. 14).

**Ecology**

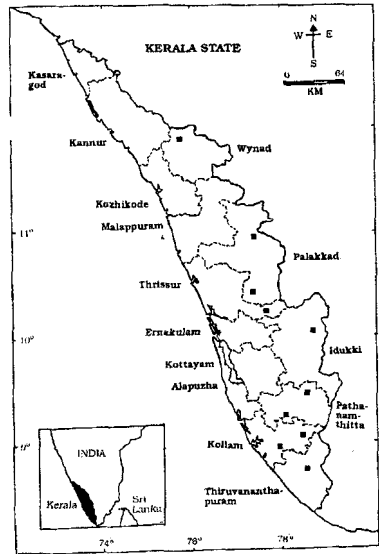
Climbers, reaching the canopy of evergreen trees in semi-evergreen and evergreen forests of Kerala, at medium and high elevations. Flowers mostly by November to January and fruits ripen during April-June.

**Distribution**

**Kerala** Wynad, Palghat, Trichur, Idukki, Pathanamthitta, Quilon and Trivandrum districts; almost throughout the State, mostly in the highlands (Map 29).

**World** Southern Peninsular India in Karnataka, Kerala and Tamilnadu.

**Notes** Taxonomically, two varieties are recognised within this species and both are reported from Kerala. They are *C. gamblei* var. *gamblei* and var. *sphaerocarpa* Becc., the former with globose-obpyriform and the latter with spherical fruits. However, the cane is not different in size or other qualitative characters.



Map 29 Distribution of *Calamus gamblei* Becc ex Becc et Hook f. in Kerala

**Products and uses**

This medium-sized cane is mainly used for making sports goods (Krishnamurthy, 1993) and umbrella handles. It is also used as a basket and furniture cane.

**Regeneration**

Naturally the species regenerates from seeds and also suckers. Seeds ripen and disperse during April to June, which sprout by the onset of first monsoon.

Artificially, the cane species can be raised from seeds. Ripened seeds collected from natural stands are removed of their outer scales and fleshy cover

by hand, before sowing. Rubbing and washing in water will be easier to remove the scales and pulpy part. The cleaned seeds are to be sown as early as possible to avoid drying and thereby losing viability (Renuka, 1991). The seeds before sowing may be treated with fungicides to prevent infection. In the nursery, initially the seeds may be kept in moist saw dust for about two weeks till they start germinating. Germination percentage reported for the seed of *C. gamblei* is around 90. The germinated seeds can be sown in polythene containers, filled with forest top soil and sand, and kept under partial shade (Renuka, 1991).

The seedlings will be ready for outplanting after one year, by the onset rainy season. In the field, the seedlings can be planted 6 - 8 metres apart in lines of 2 metres width. Planting is done after removing the polypots without disturbing the soil around roots. For planting, pits of 25 cm x 25 cm x 25 cm are ideal and the root collar of the seedlings shall be at the ground level when outplanted. Mulching and weeding can improve the survival rate and growth of seedlings. The species prefers an altitude of 700 - 2000 m above msl for its growth and comes up even in shola forests.

### References cited

- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi. pp. 497-498.
- Renuka, C. 1991. How to establish a cane plantation *KFRI Information Bulletin* 10. Kerala Forest Research Institute, Peechi. 7p:

## 29. CALAMUS HOOKERIANUS BECC. (Palmae)

### Nomenclature

*Calamus hookerianus* Becc., Ann. Roy. bot. Gardn. Calcutta 11: 83, 226, t. 70. 1908; Rama Rao, Fl. Pl. Trav. 422. 1914; Blatt., Palms Brit. India & Ceylon 307. 1926; Fisch. in Gamble, Fl. Presid. Madras 3: 1568. 1931; Renuka, Ratt. West. Ghats 30. t. 12 (A-E). 1992.

### Local name(s)

Kakka-chooral, Kallan, Vanthal, Veli-chooral.

### Description

Spiny, clustering, medium-sized, **climbing canes**; **stem** 8-10 m high, upto 4 cm in diameter with sheaths. **Leaves** pinnately compound, spirally arranged, sheathed, with the laminar portion upto 2 m in length; **petioles** upto 70 cm long, spiny; **sheaths** dark green, spinescent, brown tomentose, with ocrea

upto 8 cm in length, deciduous; **spines** upto 8 cm long, subtriangular, brown; **leaflets** upto 50 x 2.5 cm, narrowly lanceolate, ciliate along the mid vein above half the length and lateral veins on the dorsal side, acuminate and bristled at apex. **Flowers** dioecious in upto 5 m long, branched inflorescence; **male flowers** in 3-order branched inflorescences, with 3 sepals, 3 petals and 6 stamens; **female flowers** in 2-order branched inflorescences with tricarpellary ovary covered with scales. **Fruits** brown with an yellow tinge, upto 1 cm long, subglobose, 1-seeded.

**Ecology**

Climbers on trees in the semi-evergreen and evergreen forests of Kerala, at altitudes above 1000m. Flowers during January to July and fruits ripen by November-December.

**Distribution**

**Kerala**

Wynad, Palghat, Trichur, Emakulam, Pathanamthitta and Quilon districts; almost throughout the State, mostly in the highlands (Map 30).

**World**

Peninsular India in the southern Western Ghats.

**Notes**

This species has not been included among the cane species of India dealt with by Krishnamurthy (1993).

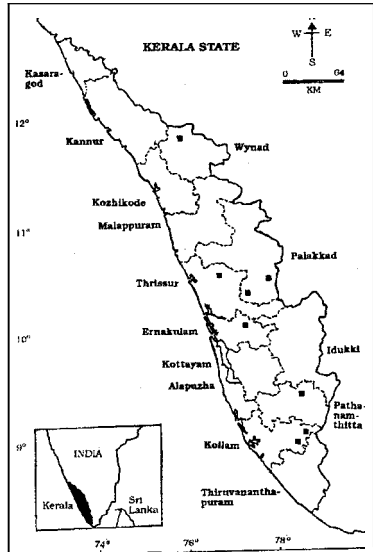
**Products and uses**

Medium-sized canes used in basket weaving and furniture making.

**Regeneration**

Natural regeneration of the species is by seeds and also suckers. Seeds ripen and disperse during April - May, which sprout by the onset of first monsoon.

Artificially, the cane species can be raised from seeds. Ripened seeds collected from natural stands are removed of their outer scales and fleshy cover by hand, before sowing. Rubbing and washing in water will be easier to remove the scales and pulpy part. The cleaned seeds have to be sown as early as possible to avoid drying and thereby loosing viability (Renuka, 1991). The seeds before sowing may be treated with fungicides to prevent



Map 30. Distribution of *Calamus hookerianus* Becc. in Kerala.



tion. In the nursery, initially the seeds may be kept in moist saw dust for about two weeks till they start germinating. Germination percentage reported for the seed of *C. hookerianus* is around 90. The germinated seeds can be pricked out to polythene containers, filled with forest top soil and sand, and kept under partial shade (Renuka, 1991).

The seedlings will be ready for outplanting after one year, by the onset rainy season. In the field, the seedlings can be planted 6 - 8 metres apart in lines of 2 metres width. Planting is done after removing the polypots without disturbing the soil around roots. For planting, pits of 25 cm x 25 cm x 25 cm are ideal and the root collar of the seedlings shall be at the ground level when outplanted. Mulching and weeding can improve the survival rate and growth of seedlings. The species comes up well in semi evergreen and evergreen forests, up to an altitude of about 1000m above msl.

### References cited

- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi. pp. 497-98.
- Renuka, C. 1991. How to establish a cane plantation *KFRI Information Bulletin* 10. Kerala Forest Research Institute, Peechi. 7p.

## 30. CALAMUS LATIFOLIUS ROXB. (Palmae)

### Nomenclature

- Calamus latifolius* Roxb., Hort. Beng. 73. 1814; Blatt., Palms Brit. India & Ceylon 326. 1926; Nicol. *et al.*, Intrap. Hort. Malab. 279. 1988; Krishnam., Min. For. Prod. India 454, 496, 497, 498. 1993.
- Calamus rheedei* Griff., Calcutta J. nat. Hist. 5: 73. 1845 (*nom. illeg.?*); Becc. *et* Hook.f. in Hook.f., Fl. Brit. India 6: 452. 1893 & in Ann. Roy. bot. Gardn. Calcutta 11: 95, 313, t. 226. 1908; Rama Roa, Fl. Pl. Trav. 422. 1914; Fisch. in Gamble, Fl. Presid. Madras 3: 1567. 1931; Renuka, Ratt. West. Ghats 46. 1992; Krishnam., Min. For. Prod. India 497. 1993.
- Daemonorops rheedii* Mart. Hist. Nat. Palm. 3: 330. 1853 (*nom. illeg.*).

### Local

Kattu-chooral.

### Description

Clustering, medium-sized canes with slender culms. **Leaves** devoid of cirrus, with narrowly lanceolate leaflets appearing in distant, 4 groups of 3 leaflets each, one leaflet of each group on one side of the rachis and two of

the other, 5 leaflets terminate the rachis, with the terminal pair free at the base; **rachis** scattered, recurved spiny. **Flowers** in pendulous inflorescence; primary sheath split open; partial inflorescence shorter than the sheath. **Fruits** upto 2 cm long, ovoid or ellipsoid.

### Ecology

As the species could not be located in the field, details are not available.

### Distribution

#### Kerala

North Kerala (exact locality not known); Fischer (1931) reported the species from the hilly tracts of Malabar.

#### World

Peninsular India.

### Notes

This cane species is not collected from Kerala during recent years and the only authority for its inclusion here is the Rheede's (1693) plate *Kattu-chooral* in *Hortus Malabaricus*. Therefore, the description given here is based only on Van Rheede's plate and literature (Blatter, 1926; Renuka, 1992) available for the species. With regard to the identity and nomenclature of the species and its synonymy with *C. rheedei*, the concept of Nicolson *et al.* (1988) is accepted here.

### Products and uses

Krishnamurthy (1993) has reported that this medium-sized cane, called the Malabar cane (Bahadur, *et al.* 1961), is used for the making of furniture, sports items, umbrella handles and walking sticks. According to Chopra, *et al.* (1956), powdered seeds of the plant are used as a curative for ulcers.

### References cited

- Bahadur, R.L., A.C. Dey, S. Ramaswami and H. Sethi 1961. Collection and processing of canes. *Indian For.* 87: 257-261.
- Blatter, E. 1926. *The Palms of British India and Ceylon*. Oxford Univ. Press, London. p. 321.
- Chopra R.N., S.L. Nayar and I.C. Chopra 1956. *Glossary of Indian Medicinal Plants*. CSIR, New Delhi. p. 44.
- Fischer, C.E.C. 1931. Family *Palmae*. In: J.S. Gamble, (ed.) *Flora of the Presidency of Madras*. vol. 3. Adlard & Son Ltd., London. p. 1567.
- Nicolson, H. Dan, C.R. Suresh and K.S. Manilal. 1988. *An Inter relation of van Rheede's Hortus Malabaricus*. Regnum Vegetabile. vol. 116. Koeltz Scientific Books. Germany. p. 279.
- Renuka, C. 1992. *Rattans of the Western Ghats: A Taxonomic Manual*. KFRI, Peechi. p. 46.

Rheede, H. A. van 1693. *Hortus Indicus Malabaricus*. vol. 12. Bishen Singh Mahendra Pal Singh, Dehra Dun. p. 123. t. 65 (reprinted).

31. CALAMUS PSEUDOTENUIS BECC. EX BECC. ET HOOK. F.  
(Palmae)

**Nomenclature**

*Calamus pseudotenuis* Becc. ex Becc. et Hook.f. in Hook.f., Fl. Brit. India 6: 445. 1892; Becc., Ann. Roy. bot. Gardn. Calcutta 11: t. 69. 1908; Rama Rao, Fl. Pl. Trav. 422. 1914; Blatt., Palms Brit. India & Ceylon 306. 1926; Fisch. in Gamble, Fl. Presid. Madras 3: 1567. 1931; Renuka, Ratt. West. Ghats 44. t. 19 (1-5). 1992; Krishnam., Min. For. Prod. India 497. 1993.

*Calamus tenuis sensu* Thw., Enum. Pl. Zeyl. 330. 1864 (non Roxb.).

**Local name(s)**

Chooral.

**Description**

Armed, clustering, medium-sized **climbing canes**; stems 6-8 m high, upto 3.5 cm in diameter with sheath. **Leaves** pinnately compound, spirally arranged, sheathed with the laminar portion upto 1.5 cm long; **rachis** upto 20 cm long, flat and channelled above, spiny; **sheaths** greyish or yellowish green, spiny, upto 10 cm long, ocreate; **spines** 3-6 cm long, thin, brown-tomentose between, differently directed; **leaflets** opposite or nearly opposite in distant groups, upto 50 x 4.5 cm, narrowly lanceolate or ensiform, sparsely ciliate along veins beneath, long acuminate at apex. **Flowers** dioecious in very long (upto 3 m), branched inflorescence; **male flowers** in 3-stage branched inflorescence with 3 sepals, 3 petals and 6 stamens; **female flowers** in 2-stage branched inflorescence, with bicarpellary, scaly ovary. **Fruits** yellowish-brown, upto 1.5 cm across, subovoid, beaked, scaly, 1-seeded (Fig. 15).



Fig. 15. *Calamus pseudotenuis* Becc. ex Becc. et Hook.f. (Courtesy: C. Renuka).

**Ecology**

Rather common climbers in evergreen and semi-evergreen forests at

dium elevations in Kerala. Flowers during October to April and occasionally during July. Fruits mature and ripen by October-November.

**Distribution**

**Kerala**

Cannanore, Wynad, Palghat, Trichur, Idukki and Trivandrum districts; mainly in the highlands (Map 31).

**World**

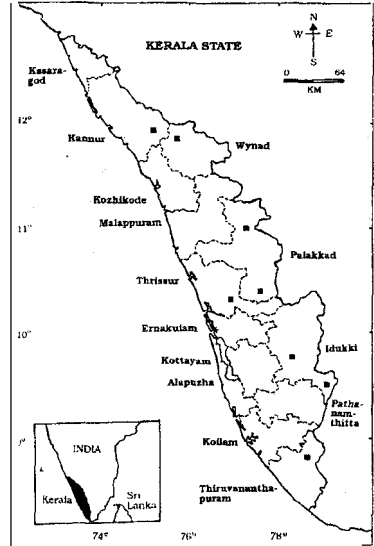
Peninsular India, Sri Lanka.

**Products and uses**

The cane produced by this species, classified as thin, is mainly used to make furniture and for basket weaving (Bahadur, *et al.*, 1961).

**Regeneration**

This clump-forming cane naturally regenerates by seeds and also suckers



Map 31. Distribution of *Calamus pseudotenuis* Becc.

Artificially, the cane species can be raised from seeds. Ripened seeds collected from natural stands are removed of their outer scales and fleshy cover by hand, before sowing. Rubbing and washing in water can help to remove the scales and pulpy part. The cleaned seeds have to be sown as early as possible to avoid drying and thereby losing viability (Renuka, 1991). The seeds before sowing may be treated with fungicides to prevent infection. In the nursery, initially the seeds may be kept in moist saw dust for about two weeks till they start germinating. Germination percentage reported for the seed of *C. pseudotenuis* is around 90. The germinated seeds can be sown in polythene containers, filled with forest top soil and sand, and kept under partial (Renuka, 1991).

The seedlings will be ready for outplanting after one year, by the onset rainy season. In the field, the seedlings can be planted 6 - 8 metres apart in lines of 2 metres width. Planting is done after removing the polypots without disturbing the soil around roots. For planting, pits of 25 cm x 25 cm x 25 cm are ideal and the root collar of the seedlings shall be at the ground level when outplanted. Mulching and weeding can improve the survival rate and growth of seedlings. The cane species prefers evergreen forests at altitudes below 700-1000 m above msl for its best growth.

**References cited**

- Bahadur, R.L., A.C. Dey, S. Ramaswami and H. Sethi 1961. Collection and processing of canes. *Indian For* 87: 257-261.
- Renuka, C. 1991. How to Establish a cane Plantation. *KFRI Information Bulletin* 10. Kerala Forest Research Institute, Peechi. 7p.

**32. CALAMUS ROTANG L.**  
( **Palmae** )

**Nomenclature**

*Calamus rotang* L., Sp. Pl. ed. 2: 325. 1753; Becc. *et* Hook.f. in Hook.f., Fl. Brit. India 6: 447. 1892; Becc., Ann. Roy. bot. Gardn. Calcutta 11:98,269. 1908; Rama Rao, Fl. Pl. Trav. 422. 1914; Blatt., Palms Brit. India & Ceylon 310. 1926; Fisch. in Gamble, Fl. Presid. Madras 3: 1568. 1931; Renuka, Ratt. West. Ghats 49. t. 20 (1-4). 1992; Krishnam., Min. For. Prod. India 496, 497. 1993.

**Local name(s)**

Chooral, Cheru-chooral.

**Description**

Armed, clustering, slender, **climbing canes; stems** 6-10 m high, 1-2 cm in diameter with sheath. **Leaves** pinnately compound, spirally arranged on the stem, sheathed with the laminar portion upto 75 cm in length; **rachis** armed with yellow spines, black at tip, upto 1 cm long; **sheaths** green, spiny; **leaf-lets** about 35 x 2 cm, narrowly lanceolate, long-acuminate, spinulose along the margins, ciliate along the mid vein beyond mid portion beneath, bristled at apex. **Flowers** pale greenish, dioecious in slender inflorescence, upto 3 m long; **male flowers** with 3 sepals, 3 petals and 6 stamens; **female flowers** with tricarpellary ovary covered with scales. **Fruits** light yellow, 1.5-2 cm long, ovoid, shallowly channelled along the mid portion, scaly, 1-seeded.

**Ecology**

Distributed in the coastal belt of the State, often in association with mangrove and other strand vegetation, forming large clumps. A common associate of this species is *Dalbergia candenatensis*. Flowers are borne during October to December and fruits ripen by April to June.

**Distribution**

Kerala

Alleppy and Quilon districts (Map 32).

World

India, Sri Lanka.

## Products and uses

The cane is used in wicker-work, furniture and basket making and as ropes. As reported by Chopra, *et al.* (1956) the roots of the plant are medicinal curing chronic fevers and are also used as an antidote against snake poison. The young shoots of this rattan are reported to be used as vegetable (Anonymous, 1950), as also, the fleshy substance around the seeds (Rama Rao, 1914).

## Regeneration

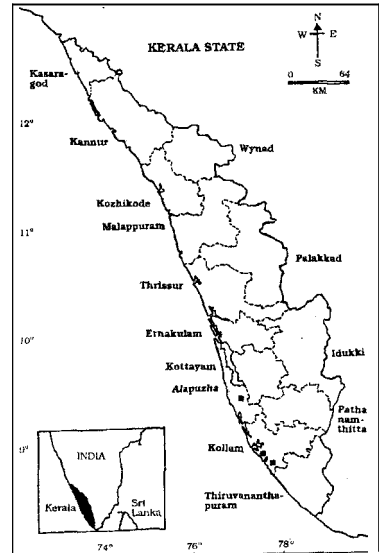
Natural regeneration of this low land cane species is by seeds and also suckers. Seeds ripen and disperse during April to June, which sprout by the onset of first monsoon.

Artificially, the cane species can be raised from seeds. Ripened seeds collected from natural stands are removed of their outer scales and fleshy cover by hand, before sowing. Rubbing and washing in water will be easier to remove the scales and pulpy part. The cleaned seeds have to be sown as early as possible to avoid drying and thereby losing viability (Renuka, 1991). The seeds before sowing may be treated with fungicides to prevent infection. In the nursery, initially the seeds may be kept in moist saw dust for about two weeks till they start germinating. Germination percentage reported for the seed of the species is around 90. The germinated seeds can be sown in polythene containers, filled with forest top soil and sand, and kept under partial shade (Renuka, 1991).

The seedlings will be ready for outplanting after one year, by the onset rainy season. In the field, the seedlings can be planted 6 - 8 metres apart in lines of 2 metres width. Planting is done after removing the polypots without disturbing the soil around roots. For planting, pits of 25 cm x 25 cm x 25 cm are ideal and the root collar of the seedlings shall be at the ground level when outplanted. Midlands and coastal areas of the State are the suitable habitats of the species.

## References cited

Anonymous, 1950. *The Wealth of India: Raw Materials*. vol. 2. CSIR, New Delhi. pp. 12-13.



Map 32. Distribution of *Calamus rotang* L. in Kerala.

Chopra, R.N., S.L. Nayar and I.C. Chopra. 1956. *Glossary of Indian Medicinal Plants*. CSIR, New Delhi. p. 44.

Rao, M. Rama 1914. *Flowering Plants of Travancore*. Govt. Press, Trivandrum. p. 422.

Renuka, C. 1991. How to establish a cane plantation. *KFRI Information Bulletin* 10. Kerala Forest Research Institute, Peechi. 7p.

### 33. CALAMUS THWAITESII BECC. ET HOOK.F. (Palmae)

#### Nomenclature

*Calamus thwaitesii* Becc. et Hook.f. in Hook.f., Fl. Brit. India 6: 441. 1892; Becc., Ann. Roy. bot. Gardn. Calcutta 11: 137. (1908), t. 10, 11. 1913 (appendix); Rama Rao, Fl. Pl. Trav. 422. 1914; Renuka, Ratt. West. Ghats 51. t. 22 (1-4). 1992.

*Calamus longisetus sensu* Thw., Enum. Pl. Zeyl. 330. 1864 (*non* Griff.).

*Calamus thwaitesii* Becc. var. *canaranus* Becc., Ann. Roy. bot. Gardn. Calcutta 11: 138. 1908. t.12. 1913 (appendix); Blatt., Palms Brit. India & Ceylon 296. 1926; Fisch. in Gamble, Fl. Presid. Madras 3: 1567. 1931.

#### Local name(s)

Panni-chooral, Thadiyan-chooral, Valiya-chooral, Vandi-chooral.

#### Description

Armed, clustering, robust **climbing canes; stems** upto 20 m high and 6 cm in diameter with sheath. **Leaves** pinnately compound, irregularly fascicled, sheathed with the laminar portion upto 3 m long; **rachis** upto 35 cm long, spiny; **sheaths** greenish-yellow, spiny, devoid of ocreae; **spines** flat, black with an yellow base, upto 3 cm long, produced on a raised surface; **leaflets** variable in arrangement, often clustered, the largest one about 80 x 45 cm, linear-lanceolate, spinulose along the margins and side of mid veins on the upper side and long bristled along the mid vein below. **Flowers** pale yellow, dioecious in upto 6 m long, decomposed inflorescence; **male flowers** distichous, with 3 sepals, 3 petals and 6 stamens; **female flowers** with tricarpellary, scaly ovary. **Fruits** yellowish brownish with brown margins, upto 2 cm long, ovoid, scaly, median grooved, apicular.

#### Ecology

Robust climbers on lofty trees in evergreen, semi-evergreen and moist deciduous forests, mostly at low and medium elevations and along banks of hill streams. Flowers during November to January and fruits ripen during April-August.

**Distribution**

**Kerala**

Cannanore, Malappuram, Palghat, Ernakulam, Idukki, Quilon and Trivandrum districts; almost throughout the State, mainly in the hilly uplands and highlands (Map 33).

**World**

Peninsular India, Sri Lanka.

**Products and uses**

Large diameter canes produced by this species are mainly used in furniture making.

**Notes**

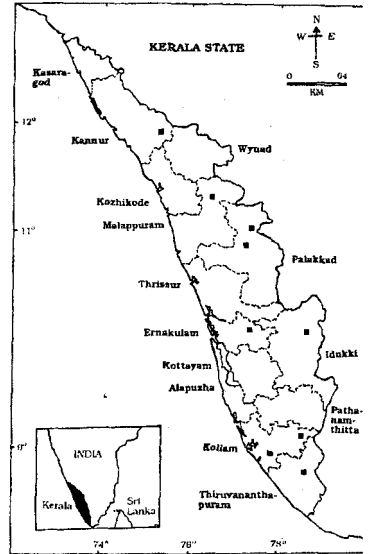
Even though one of the most useful non-timber forest produce plants, rather common in the Western Ghats, Krishnamurthy (1993) has not included the species in his work on Minor Forest Products of India.

**Regeneration**

Natural regeneration of the species is by seeds and also suckers. Seeds ripen and disperse during April to June, which sprout by the onset of first monsoon.

Artificially, the cane species can be raised from seeds. Ripened seeds collected from natural stands are removed of their outer scales and fleshy cover by hand, before sowing. Rubbing and washing in water will be easier to remove the scales and pulpy part. The cleaned seeds are to be sown as early as possible to avoid drying and thereby loosing viability (Renuka, 1991). The seeds before sowing may be treated with fungicides to prevent infection. In the nursery, initially the seeds may be kept in moist saw dust for about two weeks till they start germinating. Germination percentage reported for the seed of *C. thawaitesii* is around 90. The germinated seeds can be sown in polythene containers, filled with forest top soil and sand, and kept under partial shade (Renuka, 1991).

The seedlings will be ready for outplanting after a year, by the onset rainy season. In the field, the seedlings can be planted 8 metres apart in lines of 2 metres width. Planting is done after removing the polypots without a disturbing the soil around roots. For planting, pits of 25 cm x 25 cm x 25 cm



Map 33. Distribution of *Calamus thwaitesii* Bocc. et Hook.f. in Kerala.



are ideal and the root collar of the seedlings shall be at the ground level when outplanted. Mulching and weeding can improve the survival rate and growth of seedlings. First harvest of the cane can be done after 8 or 10 years (Parameswarappa and Lakshmana, 1992). Suckers can also be used for the multiplication of the species. Also, Lakshmana (1993) had successfully multiplied species by using suckers.

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## 34. CALAMUS TRAVANCORICUS BEDD. EX BECC. (Palmae)

### .Nomenclature

*Calamus travancoricus* Bedd. ex Becc. in Hook.f., Fl. Brit. India 6: 452. 1893; Becc., Ann. Roy bot. Gardn. Culcutta 11: 95, 310. 1908; Rama Roa, Fl. Pl. Trav. 422. 1914; Blatt., Palms Brit. India & Ceylon 320. 1926; Fisch. in Gamble, Fl. Presid. Madras 3: 1567. 1931; Renuka, Ratt. West. Ghats 53. t. 23 (1-5). 1992; Krishnam., Min. For. Prod. India 498. 1993.

### Local name(s)

Ari-chooral, Cheru-chooral, Kattu-chooral.

### Description

Armed, clustering, slender, **climbing canes; stems** upto 15 m high and 0.8 cm in diameter with sheath. **Leaves** pinnately compound, spirally arranged, sheathed with the laminar portion upto 45 cm long; **rachis** 6-10 cm long, spiny; **sheaths** green, spiny with pappery ocrea; **spines** upto 0.5 cm long, slender; **leaflets** 3-5 clustered, the largest one upto 25 x 2 cm, oblanceolate, sparsely hairy, long-acuminate. **Flowers** dioecious, in upto 50 cm long, branched inflorescence; **male flowers** in slender and longer inflorescence, with 3 sepals, 3 petals and 6 stamens; **female flowers** in shorter inflorescence, with tricarpellary, scaly ovary. **Fruits** light yellow with brown, upto 1 cm in diameter, globose, scaly, 1-seeded.

**Ecology**

A slender climber on medium-sized trees, rather very rare in the semi-ever-green and moist deciduous forests of low and medium elevations. Both at Aryankavu and Edamalayar, the cane is seen in valleys adjacent to hill streams, in less lush vegetation. Flowers in October-November and fruits mature and ripen during April to June.

**Distribution**

**Kerala**

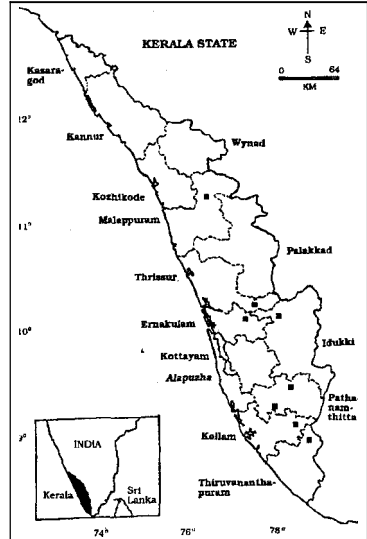
Malappuram, Trichur, Ernakulam, Idukki, Pathanamthitta, Quilon and Trivandrum districts; central and southern parts of the State, mainly from the mid to the highlands (Map 34).

**World**

Peninsular India in Karnataka, Kerala and Tamil Nadu.

**Products and uses**

Slender but strong canes used mainly in handicraft industry and for furniture making. Nambiar, *et al.* (1985) has reported that the leaves of this cane species are medicinal, used in the treatment of biliousness, worms, dyspepsia and ear complaints. Further, Chopra, *et al.* (1956) had mentioned that tender leaves of this rattan are considered as anthelmintic. Fruits are also dried powdered and administered in hot water to cure rheumatism, severe biliousness and to expel phlegm (Rama Rao, 1914).



Map 34 Distribution of *Calamus travncorica* Bedd ex Becc in Kerala

**Regeneration**

Natural regeneration of the species is by seeds and also suckers. Seeds ripen and disperse during April to June, which sprout by the onset of first monsoon.

Artificially, this slender cane species can be raised from seeds. Ripened seeds collected from natural stands are removed of their outer scales and fleshy cover by hand, before sowing. Rubbing and washing in water will also help to remove the scales and pulpy part. The cleaned seeds are to be sown as early as possible to avoid drying and thereby losing viability (Renuka, 1991). The seeds before sowing may be treated with fungicides to prevent infection. In the nursery, initially the seeds may be kept in moist saw dust for about two weeks till they start germinating. Germination

age reported for the seed of *C. travancoricus* is around 90. The germinated seeds can be sown in polythene containers, filled with forest top soil and sand, and kept under partial shade (Renuka, 1991).

The seedlings will be ready for outplanting after a year, by the onset rainy season. In the field, the seedlings can be planted 8 metres apart in lines of 2 metres width. Planting is done after removing the polypots without disturbing the soil around roots. For planting, pits of 25 x 25 x 25 cm are ideal and the root collar of the seedlings shall be at the ground level when outplanted. Semi evergreen and evergreen forests at 300- 600m elevation above msl are suitable habitats of this cane species. Mulching and weeding can improve the survival rate and growth of outplanted seedlings.

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- Rao, M. Rama 1914. *Flowering Plants of Travancore*. Govt. Press, Trivandrum. p. 422.
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## 35. CALAMUS VATTAYILA RENUKA (Palmae)

### Nomenclature

*Calamus vattayila* Renuka, Curr. Sci. 56: 1012. 1987 & in Ratt. West. Ghats 53. pl. 24, fig. 1-5. 1992.

### Local name(s)

Chooral.

### Description

Armed climbing canes, usually not forming clumps; **stems** upto 15 m in length, upto 2.5 cm in diameter including sheath and internodes upto 20 cm in length; **culm-sheaths** dark green, scattered spiny; **spines** upto 2 cm long, rarely pointing upwards; **ocrea** upto 0.5 cm long, small. **Leaves** ecirrate, pinnately compound, upto 1 m long; **rachis** upto 25 cm in length, spiny; **leaflets** upto 40 x 10 cm, elliptic, 6-veined, bristle-tipped. **Flowers** dioe-

cious in axillary, sheathed inflorescence of upto 60 cm length with the female ones heavily branched and upto 1 m long and the partial inflorescence upto 40 cm in length; **male flowers** with 3 sepals, 3 petals and 6 stamens; **female flowers** upto 0.5 cm long with tricarpellary ovary covered with scales and 6 staminodes. **Fruits** chestnut-brown, about 2.5 x 0.8 cm, oblong with persistent style upto 0.4 cm long and 27 rows of scales, 1-seeded.

### Ecology

A rattan, occurring only sporadically in the evergreen and semi-evergreen forests of Kerala. Flowers open by September-October and during June-July fruits mature.

### Distribution

#### Kerala

Wynad, Malappuram, Palghat, Trichur, Idukki, Pathanamthitta and Quilon districts; almost throughout the State, mostly in the highlands (Map 35).

#### World

Endemic to Peninsular India in the Western Ghats of Kerala, Karnataka and Tamil Nadu.

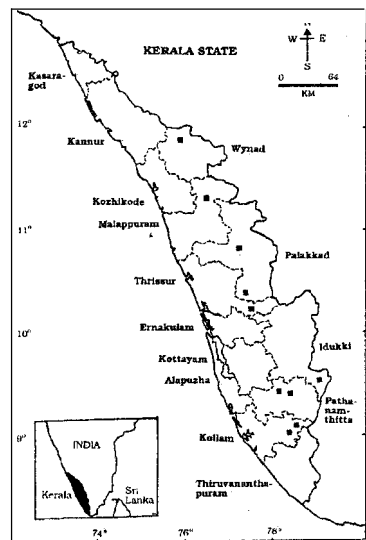
### Products and uses

This newly described rattan of medium size has been reported (Renuka, 1992) to be a good quality cane, mainly used in furniture industry. It is an addition to the useful rattans enumerated by Krishnamurthy (1993) for India.

### Regeneration

This single stemmed cane regenerates naturally by seeds. Seeds ripen and disperse during April to June, which sprout by the onset of first monsoon.

Artificially, the cane species can be raised from seeds. Ripened seeds collected from natural stands are removed of their outer scales and fleshy cover by hand, before sowing. Rubbing and washing in water will be easier to remove the scales and pulpy part. The cleaned seeds are to be sown as early as possible to avoid drying and thereby losing viability (Renuka, 1991). The seeds before sowing may be treated with fungicides to prevent infection. In the nursery, initially the seeds may be kept in moist saw dust for about two weeks till they start germinating. Germination percentage reported



Map 35. Distribution of *Calamus vattayila* Renuka in

for the seed of *C. vattayila* is around 90. The germinated seeds can be sown in polythene containers, filled with forest top soil and sand, and kept under partial shade (Renuka, 1991).

The seedlings will be ready for outplanting after a year, by the onset rainy season. In the field, the seedlings can be planted 8 metres apart in lines of 2 metres width. Planting is done after removing the polypots without disturbing the soil around roots. For planting, pits of 25 x 25 x 25 cm are ideal and the root collar of the seedlings shall be at the ground level when outplanted. Mulching and weeding can improve the survival rate and growth of outplanted seedlings. The species prefers evergreen forests at 250 - 800 m elevation for its better growth.

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- Renuka, C. 1991. How to establish a cane plantation. *KFRI Information Bulletin* 10. Kerala Forest Research Institute, Peechi. 7p.
- Renuka, C. 1992. *Rattans of the Western Ghats. A Taxonomic Manual*. KFRI, Peechi. p. 57.

## 36. CALLICARPA TOMENTOSA (L.) L. ( Verbenaceae )

### Nomenclature

- Callicarpa tomentosa* (L.) L. in Murray, Syst. Veg. ed. 13: 130. 1774; Meeuse, Blumea 5: 71. 1942; Nicol. *et al.*, Intrap. Hort. Malab. 259. 1988.
- Tomex tomentosa* L., Sp. Pl. 118. 1753.
- Callicarpa lanata* L., Mant. Pl. 2: 331. 1771; Clarke in Hook.f., Fl. Brit. India 4: 567. 1885; Bourd., For. Trees Trav. 256. 1908; Rama Rao, Fl. Pl. Trav. 314. 1914; Gamble, Fl. Presid. Madras 2: 1092. 1924.
- Callicarpa lobata* Clarke in Hook.f., Fl. Brit. India 4: 566. 1885.
- Callicarpa rheedii* Kostel., Allg. Pharm.-Med. Fl. 3: 829. 1834.
- Callicarpa wallichiana* Walp., Rep. 4: 125. 1845; Wt., Ic. Pl. Ind. Orient. t. 1480. 1849.

### Local

Cheru-thekku, Nai-kumbil, Thin-perivelam.

### Description

Large **shrubs** or small **trees**, 2-4 m high; **branchlets** rounded or terete,

fulvous-stellate hairy; **bark** grey or light brown, thin, rough, corky, aromatic. **Leaves** confined to branch apices, simple, 12-22 x 5.5-14 cm, ovate, elliptic-lanceolate or lanceolate, densely greyish tomentose beneath, rounded, cordate, or acute at base, acuminate or attenuate-acuminate at apex; **petioles** 2-6.5 cm long, stout, densely tomentose. **Flowers** pink, violet, pale red, reddish purple or black, upto 1 cm long, in divaricately dichotomous, axillary cymes; **calyx** upto 0.2 cm long, stellate-tomentose, truncate or obscurely 4-lobed at apex; **corolla** tubular, upto 0.2 cm long, subequally 4-lobed with lobes upto 1.5 cm long, rounded apically; **stamens** 4, exerted with slender, long, sparsely hairy filaments and white or light yellowish-orange coloured, oblong anthers; **pistil** with glabrous, globose ovary and bifid stigma. **Drupe** dark purple or black, upto 0.4 cm in diameter, globose, smooth, shiny; **seeds** oblong.

### Ecology

Rather common in openings, along stream banks, disturbed forest areas, teak plantations, reed breaks, forest fringes, cleared forest areas and so on, in the moist deciduous forest tracts of the State. Flowers are mostly produced during November to April and fruits mature by May-June. On several occasions, flowers and fruits are seen on the plant almost throughout the year.

### Distribution

#### Kerala

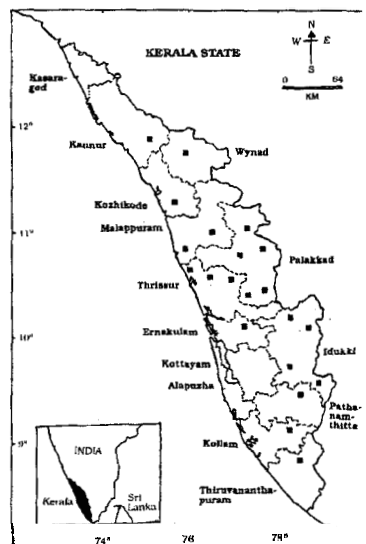
Cannanore, Wynad, Calicut, Malappuram, Palghat, Trichur, Ernakulam, Idukki, Pathanamthitta, Quilon and Trivandrum districts; almost throughout the State (Map 36).

#### World

India, Sri Lanka, Bangladesh, Nepal, Bhutan, Mauritius, Myanmar, Thailand, Malesia, Philippines, Celebes, Java, Sumatra, Timor, New Guinea, Hongkong, Chekiang and Europe.

### Products and uses

Bark, roots and leaves and the softwood used for carving are the major products extracted from this plant. Roots are made into a poultice for cutaneous diseases and to cure sores. The juice from roots is also a remedy for stomach ache (Babu, 1990). Leaves boiled with milk are used as mouth-wash which is medicinal for aphthae of mouth. Bark, like the root, is curative for fever,



Map 36 Distribution of *Callicarpa tomentosa* (L) in Kerala

hepatic obstruction, etc. and is also the source of Aroosha fibre. The bark is also chewed like betel leaf.

### Production and marketing

The medicinal roots of the plant is the main product collected and marketed from the natural forests of Kerala. During 1994-95 to 1996-97, the quantity of the item received by the Kerala State SC & ST Federation (1998) is about 2753 kg at a procurement rate of Rs. 9.50 per kg which was sold for Rs. 10.00 per kilogram.

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- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi. p. 347.
- Shiva, M.P., Saritha Aswal, Abha Sharma, Pravin Mathur and Rakesh Chandra *Trends of Export and Import of Minor Forest Products in India*. Centre for Minor Forest Products, Dehra Dun. 38 p.

## 37. CALOPHYLLUM INOPHYLLUM L. ( Guttiferae )

### Nomenclature

*Calophyllum inophyllum* L., Sp. P. 1.5 13. 1753; Wt. *et* Arn., Prodr. 103. 1834; Wt., III. Ind. Bot. t. 77. 1840; T. And. in Hook.f., Fl. Brit. India 1: 273. 1874; Bourd., For. Trees Trav. 25. 1908; Rama Rao, Fl. Pl. Trav. 34. 1914; Gamble, Fl. Presid. Madras 1: 76. 1915; Mahesh., Bull. bot. Surv. India 2: 145. 1960; Nicol. *et al.*, Intrap. Hort. Malab. 82: 1988; Singh in Sharma *et* Sanjapp. (ed.) Fl. India 3: 92-93. 1993; Krishnam., Min. For. Prod. India 288, 292. 1993.

### Local name(s)

Punna.

### Description

**Trees**, 10-15 m high; **bark** rough, often cracking; **branchlets** twiggy, glabrous. **Leaves** simple, deccusate, 8-13 x 4-9.5 cm, oblong-ovate, entire, thick, coriaceous, glabrous, dark green above with close parallel nerves, acute at base, rounded at apex; **petioles** 1-1.5 cm long, stout, glabrous. **Flowers** white, polygamous, upto 2 cm across, in axillary subcorymbose racemes, upto 7 cm long; **pedicels** 2-2.5 cm long, glabrous; **calyx** with 4 sepals, the

outer pair upto 0.6 x 0.4 cm, inner pair upto 1 x 0.7 cm, obovate, petaloid; **corolla** with 4 petals, each 1.5 x 0.5 cm, oblong; **stamens** numerous in 4 or 5 bundles with filaments free, upto 0.7 cm long and anthers about 0.2 cm long, oblong; **pistil** with 1-loculed, 1-ovuled ovary, style upto 0.5 cm long and peltate stigma. **Drupes** green ripening yellow or reddish brown, upto 3.5 x 3 cm, globose with thick pericarp; **seeds** upto 1.5 cm across, rounded.

### Ecology

Graceful trees, mostly confined to the banks of hill streams in semi-evergreen and moist deciduous forests. The dense crown of the tree makes it prominent in forest areas. Flowers mostly during February to June and fruits ripen by February - March. Also planted outside forest areas as an ornamental tree.

### Distribution

#### Kerala

Kasaragod, Cannanore, Wynad, Calicut, Malappuram, Palghat, Trichur, Ernakulam, Quilon and Trivandrum districts; almost throughout the State, mainly in the low and midlands (Map 37).

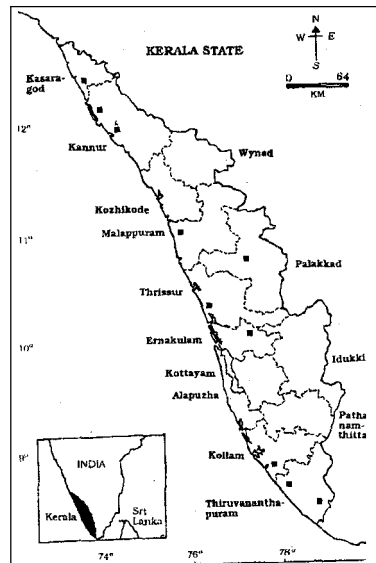
#### World

India, tropical East Africa to Taiwan, the Ryukyu and Line Islands, New Caledonia.

### Products and uses

The tree, known as Alexandrian Laurel, is the source of a seed-oil of very good quality used in soap manufacture and as an illuminant and lubricant.

The oil, known as Wundi, Pinnay, Domba or Dilo, is not suitable for edible purposes because of the presence of toxic constituents. The oil after refinement is reported (Anonymous, 1950) to be used for intra-muscular injections as, again killer in leprosy and in the treatment of skin diseases and rheumatism (Singh, 1993). The resin (10-30%) content of the oil makes a quality varnish and mixed with that of *Vateria indica* L. is used for caulking boats. Also, the bark of *Calophyllum inophyllum* trees contains about 10% of tannin. Powdered bark is medicinal for orchitis and the juice of the bark is a well known purgative and an emetic and applied to wounds and ulcers (Singh, 1993). A decoction of flowers is also given to cure venereal diseases, eczema



Map. 37. Distribution of *Calophyllum inophyllum* L. in



and insanity. The saponin and hydrocyanic acid content of leaves makes it a fish poison and bark boiled in water is used for dyeing fish-nets.

### **Production and marketing**

Seeds of the tree are collected and marketed for extraction of oil. The Kerala State SC & ST Federation (1998) had included it as one of the non-wood forest produce item which they deal without details on the quantity that the Federation handled during the period 1994-95 to 1996-97. However, the cost of the item, as fixed by the Federation, is Rs. 5.00 per kilogram for the period.

### **Regeneration**

The tree, which is a light-demander is also tolerant to xerophytic conditions of its natural habitat. It coppices moderately well and is sensitive to frost and fire (FRI, 1980). The seed dispersal is often aided by water and fruit-eating animals like bats. Dispersed seeds germinate well, and therefore, natural regeneration of the species is fairly good.

For artificial regeneration of the tree, seeds can be collected during March. On an average, 137 to 212 fruits (seeds) weigh one kilogram (FRI, 1980). The seeds lose their viability on storage due to the oily nature. Germination rate of seeds is noted to be good and if the thick seed-coat is removed before sowing in the nursery, the percentage may reach upto 90, as has been reported from Philippines (FRI, 1980). Planting of nursery-raised seedlings and direct sowing of seeds in the field are the usual methods to regenerate the species. In Kerala, underplanting of the seedlings of *C. inophyllum* in teak plantations at Nilambur had met with only partial success (FRI, 1980).

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**38. CANARIUM STRICTUM ROXB.**  
( Burseraceae )

**Nomenclature**

*Canarium strictum* Roxb., Fl. Indica 3: 138. 1832; Wt. et Arn., Prodr. 175. 1834; Bedd., Fl. Sylvat. South. India t. 128. 1871; Benn. in Hook. f., Fl. Brit. India 1: 534. 1875; Bourd., For. Trees Trav. 68. 1908; Rama Rao, Fl. Pl. Trav. 70. 1914; Gamble, Fl. Presid. Madras 1: 172. 1915; Krishnam., Min For. Prod. Indica 34. 278. 1993.

*Canarium resiniferum* Brace ex King, J. Asiatic Soc. Bengal 62 (2): 188. 1894.

**Local name(s)**

Karutha-kunthirikam, Kunthirikam, Kunthirika-payin, Thelli, Viraka.

**Description**

**Trees**, 30-40 m high; **branchlets** velvety-tomentose. **Leaves** alternate, imparipinnate; **leaflets** 3-5 pairs with a terminal odd one, 10-20 x 4-10 cm, ovate to elliptic, entire or crenate-serrate, coriaceous, glabrous above, tomentose beneath, oblique, subcordate, obtuse or broadly cuneate at base, acuminate at apex; **petiolules** upto 1.5 cm long, glabrous. **Flowers** polygamous, trimerous, upto 0.8 cm across, in about 10 cm long, axillary panicles; **male flowers** creamy white, upto 0.7 cm long; **calyx** tubular, campanulate, upto 0.4 cm long with 3 lobes, each lobe upto 0.1 cm long and triangular in shape; **corolla** of 3 petals, each almost 0.7 x 0.3 cm, apiculate; **stamens** 6, free on the disc, connate into a staminal column of about 0.3 cm length with oblong anthers; **disc** upto 0.1 cm long, 6-lobed, intrastaminal; **female flowers** yellow, upto 0.9 cm long, with calyx and corolla as in the male flowers, ovary upto 0.3 cm long and pilose, style upto 0.1 cm in length and capitate stigma. **Drupes** 3-4 x 1-2 cm, ellipsoid or obovoid, blunt at base and apex, 1-seeded (Fig. 16).



Fig 16 *Canarium strictum* Roxb

**Ecology**

Large, buttressed trees with spreading branches forming one of the dominant species mainly in the semi-evergreen and evergreen forests of Kerala.

The tree is deciduous and flowers are borne during January-March. Mature fruits are seen in November-December, when the trees begin to shed leaves. The bright, yellow young leaves, turning crimson, make this tree prominent in the forests.

### Distribution

#### Kerala

Palghat, Trichur, Ernakulam, Idukki, Pathanamthitta and Trivandrum districts; mostly in the central and southern parts of the State, mainly in the highlands (Map 38).

#### World

Peninsular India.

### Products and uses

Resin extracted from the trunk of the tree by tapping constitutes the Black Dammar of commerce. The common method of extraction of resin is to burn and scorch the bark and outer layer of wood at the base of the trunk promoting exudation or by making incisions and scorching the wounded portion. The exuded resin hardens into bright, black-coloured masses, glassy in consistence (Krishnamurthy, 1993).

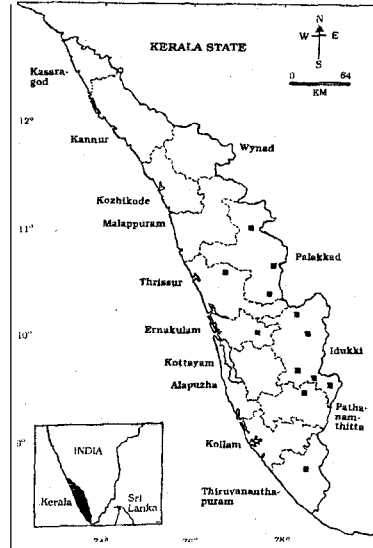
Black Dammer is used in the manufacture of varnishes, bottling wax and as a substitute for Burgundy pitch in medicinal plasters. With gingili oil, the resin is also used in the treatment of rheumatism and chronic skin diseases (Chopra, *et al.* 1956).

### Production and marketing

Large quantities of the bark-resin called Black Dammar is extracted and marketed from the natural forests of Kerala. The Kerala State SC & ST Federation (1998) recorded a turnover of about 2,87,673 kg of the resin as handled by them, graded into first and second qualities. The cost of first quality Dammar is around Rs. 75.00 per kilogram and that of second quality Rs. 50.00, which the Federation had fixed for the period 1994-95 and

### Regeneration

Natural regeneration of the species is by coppices, root-suckers and also by germination of seeds. Being draught and fire-hardy, survival of the new



Map 38. Distribution of *Canarium strictum* Roxb. in Kerala.

recruits is also satisfactory. The species can be artificially regenerated from seeds and root suckers. Rarely, stem cuttings are also used for regeneration, especially when plantings have to be done along boundaries (FRI, 1985). On an average, 9500 seeds weigh one kilogram and ripened seeds can be collected during November to January from fruits developed subsequent to the flowering which takes place in April, May and June. The seeds on storage will lose their viability within a year (Dent, 1948). Entire transplanting of nursery raised seedlings is the best method to artificially regenerate the species rather than seed-sowing and stump-planting.

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- Shiva, M.P., Saritha Aswal, Abha Sharma, Pravin Mathur and Rakesh Chandra 1996. *Trends of Export and Import of Minor Forest Products in India*. Centre for Minor Forest Products, Dehra dun. 38 p.

## 39. CANNABIS SATIVA L. SSP. INDICA (LAMK.) SMALL ET CRONQ. ( Cannabaceae )

### Nomenclature

- Cannabis sativa* L. ssp. *indica* (Lamk.) Small et Cronq., Taxon 25: 426. 1976.
- Cannabis indica* (Rumph. Herb. Amb. 5: 208. t. 77. fig. 1. 1747, *nom. nud.*) Lamk., Encyl. Meth. Bot. 1: 695. 1783.
- Cannabis sativa* L. ssp. *indica* var. *indica* (Lamk.) Wehm. Pflanzenfam. 248. 1911.
- Cannabis sativa* L. var. *indica* (Lamk.) Boorsma, Teysm. 3: 796. 1892.
- Cannabis sativa sensu* Roxb., Fl. Indica 3: 772. 1832; Hook. f. in Hook. f. Fl. Brit. India 5: 487. 1890; Rama Rao, Fl. Pl. Trav. 377. 1908; Gamble, Fl. Presid. Madras 3: 1350. 1928; Oza, Indian For. 98: 349-355. fig. 1. 1972; Krishnam., Min For. Prod. India 34, 293, 382, 409. 1993.

**Local name(s)**

Kanchavu, Kanchavu-chedi.

**Description**

Erect, annual **herbs** or **undershrubs**, upto 1.5 m high; stem much branched, slender, angular, hairy when young.

**Leaves** often opposite below and alternate above, often palmately **3-8** foliate towards base and **3-1** foliate towards apex, passing into bracts; **leaflets** sessile, 6- 14 x 0.3- 1.5 cm, narrowly lanceolate, coarsely acute-serrate, scabrid on the upper surface, slightly hairy beneath, narrowed at base, long acuminate at apex. **Flowers** greenish, bisexual, male or female; **male flowers** in short, dense, pendulous cymes united into lax, foliate, terminal panicles with very short pedicels and 5 stamens, erect in bud; **female flowers** solitary, axillary, with sessile, 1-loculed ovary, central style and stigma with two branches, each upto 0.5 cm long, feathery and cauducous. **Fruits** upto 0.5 cm long, smooth, shiny achenes, enclosed in secondary bracts (Fig. 17).



Fig. 17. *Cannabis sativa* L. ssp. *indica* (Lamk.) Small. et Cronq.

**Ecology**

Aromatic herbs, growing wild or in unauthorised cultivation in forest areas, tribal settlements, etc. Flowers during January to April.

**Distribution**

Kerala

Idukki District (Map 39).

World

India, Afghanistan, Pakistan, Cameroon, Tanzania, Ghana, Tanganika, Ethiopia, Rhodesia, Sierra, Morocco, South Africa, Angola, Thailand, Lebanon, Mexico.

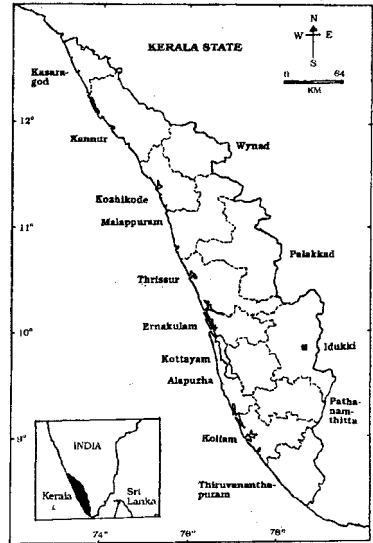
**Notes**

The plant goes under the name *Canabis sativa* L. in Indian Floras. The species has been recently subdivided into two subspecies and several varieties (Small and Cronquist, 1976). Accordingly, plants found in India (culti-

vated or wild) have been identified as subspecies *indica* with two varieties namely var. *indica* and var. *jiristanica* (Vavil.) Small et Cronq. Both the varieties are available in the country and the Peninsular Indian form of the species is var. *indica*. The subspecies *indica* and the varieties belonging to it are characterised by considerably more intoxicant properties, whereas subspecies *sativa* and its varieties, ie. var. *sativa* and var. *spontanea* Vavil. distributed mostly in United States, Canada, former USSR and such temperate countries, are with limited intoxicant properties.

### Products and uses

This plant is medicinally used as a tonic, intoxicant, stomachic, antiseptic, analgesic, narcotic, sedative and anodyne (Chopra, *et al.* 1956). The extract of leaves is also used to remove dandruff and to prevent hair-fall (Krishnamurthy, 1993).



Map 39. Distribution of *Cannabis sativa* L. ssp. *indica* (Lamk.) Small. et Cronq. in Kerala.

*Cannabis sativa* is well known as a drug plant (Krishnamurthy, 1993), and Oza (1972) has classified the drug products as follows:

- Bhang** : Dried, crushed mature leaves and tops of female plants growing in wild.
- Charas** : Cannabis resin exuded from leaves, stems and fruits, extracted from tops of female plants.
- Ganja** : Resin from unfertilized female flowering shoots; the quality and quantity of resin diminishes on fertilization.
- Hashish** : A concentrated form of Bhang; also all forms of Cannabis drugs are referred to as Hashish, especially in Britain and other European countries. Hashish is made from the dried tip of female plants when the seeds are undeveloped.
- Marijuana** : All forms of Cannabis products, as designated in North and South America. Other than medicinal and narcotic products, the plant also yields fibre and oil (Anonymous, 1950). Fibre is extracted from the stem by water-retting. Hemp fibre, as it is called, is a strong and lustrous fibre, quite durable and therefore used in the manufacture of fine cordage, twine, sail cloth, tarpaulins and carpet yarns (Krishnamurthy, 1993). Loose fibre is also used for caulking boats, pumps, etc. Hemp seed oil is a substitute for linseed oil used in varnish and paint industries. The oil is also used as lamp-oil.

### Production and marketing

The average yeild of Ganja is about 200 kg per hectare which may go up to almost double the quantity in exceptional cases (Anonymous, 1950). Data on total Cannabis production in India is also available (Anonymous, 1950). However, being a banned item, information on its regeneration, production and marketing is not in the recent records of the Kerala State SC & ST Federation (1998) or other documents dealing with non-wood forest produces, including the official documents of the Kerala Forest Department.

### References cited

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- Chopra, R.N., S. L. Nayar and I. C. Chopra., 1956. *Glossary of Indian Medicinal Plants*. CSIR, New Delhi. p. 48.
- Kerala State SC & ST Federation 1998. Different items of LFPP handled during 1994-95 to 1996-97 and price fixed by MFP Committee per kilogram for 1997-98. Trivandrum (unpublished).
- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi. p. 34, 293, 382.
- Oza, G.M. 1972. On the botanical identity of Bhang, Charash, Ganja, Hashish and arijuana and its impact on judiciary and society. *Indian For* 98: 349-356. fig.1.
- Small, Ernest and Arthur Cronquist 1976. A practical and natural taxonomy for *Cannabis*. *Taxon* 25: 405-435.

## 40. CASSIA AURICULATA L. (Caesalpiniaceae)

### Nomenclature

*Cassia auriculata* L., Sp. Pl. 379. 1753; Wt. *et* Arn., Prodr. 290. 1834; Baker in Hook.f., Fl. Brit. India 2: 263. 1878; Rama Rao, Fl. Pl. Trav. 139. 1834; Gamble, Fl. Presid. Madras 1:402. 1919; Krishnam., Min. For. Prod. India 15, 188,327,328.1993.

*Senna auriculata* Roxb., Fl. Indica 2: 249. 1832.

### Local name(s)

Avaram.

### Description

**Shrubs**, 2-3.5 m high; **branchlets** finely pubescent; **bark** smooth, reddish brown. **Leaves** alternate, abruptly pinnate, 5-10cm long, densely fulvous-pubescent, glandular between each pair of leaflets; **leaflets** 7-12 pairs, slightly overlapping, 1.5-2x0.5-1cm, oblong-obovate, glabrous and dull green above,

finely pubescent and pale beneath, entire, cuneate, truncate or obtuse at base, obtuse or emarginate and mucronate at apex; **petiolules** upto 0.2 cm long; **stipules** upto 1 cm long, foliaceous, persistent. **Flowers** golden yellow, in terminal or axillary, corymbose racemes, upto 10cm long; **pedicels** upto 2 cm long, slender, glabrous; **calyx** with 5 sepals, the outer ones smaller than the inner, upto 1.5 x 1 cm, ovate, glabrous, obtuse at apex; **corolla** with 5 petals, each upto 3 x 2 cm, ovate-orbicular, clawed, often crisped along the margins; **stamens** 10, upper 3 staminodes and the remaining 6 fertile, with upto 0.3 cm long filaments and almost 0.1 cm long anthers and an odd stamen with filaments upto 1.5cm long and anthers about 1 cm in length; **pistil** with many ovuled ovary, upto 1.5cm long, style about 1 cm long and terminal stigma. **Pods** 6-11 x 1-1.5 cm, oblong, flat, thin, depressed between seeds, obtuse and mucronate at apex; **seeds** 6 or upto 20 per pod, upto 0.6 cm long, ovoid.

**Ecology**

Spreading shrubs, common in plains and drier parts of the State, especially in gravelly soil. Flowers and fruits are borne mostly during July to October, but persistent almost throughout the year.

**Distribution**

Kerala

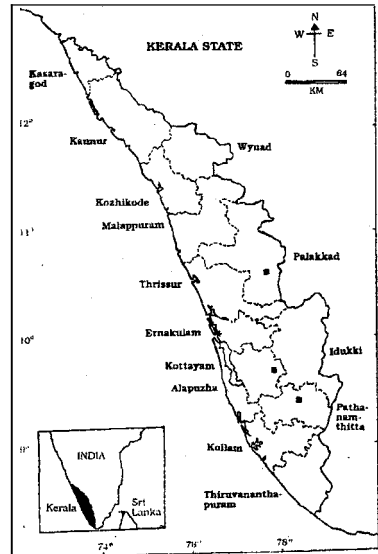
Palghat, Kottayam, Pathanamthitta and Quilon districts, and other southern parts of the State (Map 40).

World

India, Sri Lanka, Myanmar.

**Products and uses**

Avaram bark is the product extracted from the plant which is one of the main indigenous tanning materials of South India. The bark after collection is dried and marketed in large quantities for use in tanneries. The tannin content of the bark increases with age of the plant and maximum content is at 3-5 years of age twigs about in cm in diameter out the maximum quantity of tan. Avaram tannin penetrates the hide very fast and produces light coloured, elastic grain with sufficient tensile strength. Medicinally, avaram bark is also reported to be an astringent and the leaves and fruits are used as anthelmintic. The roots



Map 40 Distribution of *Cassia auriculata* L in Kerala



are also used in the treatment of skin diseases. The flower buds and open flowers are also reported to be edible (Krishnamurthy, 1993).

### Production and marketing

Avaram bark of commerce is the dried stem-bark of the plant. The product is extracted from naturally growing plants in both forest and non-forest areas. However, there is no estimate on the total production and marketing of the item with the Kerala State SC & ST Federation (1998) and for Tamilnadu, it is reported to be about 11000 tonnes per annum (Anonymous, 1950). The other South Indian States which produce the item are Andhra Pradesh and Karnataka.

### Regeneration

This xerophytic, evergreen shrub is a strong light demander even though it tolerates shade also to some extent. But the plant is sensitive to frost but can survive in draught conditions. It is a prolific coppicer and also regenerates well from seeds in natural conditions, even on poor and dry soil.

For artificial regeneration, ripened pods can be collected from mother plants during January to June and the seeds may be separated by beating and winnowing, after sun-drying the pods. The seeds remain viable for about 10 months in storage, in any type of container (Venkataswamy, 1968). About 3200 seeds weigh one kilogram and without any pre-treatment almost 50% germination and 51 plant percent can be obtained. Nursery sown seeds germinate within a fortnight. However, nursery raised seedlings fail to give satisfactory results on field planting (Venkataramany, 1968). Therefore, for the artificial regeneration of the species, seeds are to be sown in the field direct and for this different methods like broadcasting, furrow-sowing, sowing and ploughing, sowing in plough-furrows, dibbling seeds under bushes, etc. can be followed (Venkataswamy, 1968).

### References cited

- Anonymous, 1950. *The Wealth of India: Raw Materials*. vol. 2. CSIR. New Delhi. p. 96.
- Kerala State SC & ST Federation 1998. Different items of LFPP handled during 1994-95 to 1996-97 and price fixed by MFP Committee per kilogram for 1997-98. Trivandrum (unpublished).
- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi. p. 188.
- Venkataramany, P. 1968. Silviculture of the species of the genus *Cassia* Linn. *Silviculture of Indian Trees*. No. 23. Controller of Publications, Delhi. 36

**41. CASSIA FISTULA L.**  
(Caesalpinaceae)

**Nomenclature**

*Cassia fistula* L., Sp. Pl. 377. 1753; Wt. et Arn., Prodr. 285. 1834; Bedd., Fl. Sylvat. South. India 91. 1871; Baker in Hook.f., Fl. Brit. India 2: 261. 1878; Bourd., For. Trees Trav. 124. 1908; Rama Rao, Fl. Pl. Trav. 137. 1914; Gamble, Fl. Presid. Madras 1: 400. 1919; de Wit, Webbia 11: 207. 1955.; Nicol. *et al.*, Intrap. Hort. Malab. 129. 1988; Krishnam., Min. For. Prod. India 15, 35, 188, 328, 347. 1993.

*Cassia rhombifolia* Roxb., Fl. Indica 3: 334. 1832; Wt., Ic. Pl. Ind. Orient. t. 269. 1840.

**Local name(s)**

Kanikonna, Konna, Konna-maram.

**Description**

Deciduous **trees**, 8-12 m high; **branchlets** glabrous. **Leaves** alternate, abruptly pinnate, 15-40cm long; **leaflets** 4-8 pairs, 4-13 x 2-7 cm, opposite or subopposite, oblong-ovate, glabrous above, entire, pubescent below, subacute at base, acute at apex; **petioles** 3-6 cm long; **petiolules** 0.5-1 cm long. **Flowers** bright yellow in terminal, drooping, racemes, 15-40 cm long; **bracts** almost 0.7 cm long, ovate, obtuse at apex; **calyx** with 5 sepals, each almost 1 cm long, oblong-obtuse, pubescent; **corolla** with 5 subequal obovate, shortly clawed petals, upto 3.5 cm across; **stamens** 10, upper 3 with erect filaments upto 0.7 cm long and basifixed anthers, lower 3 with curved filaments and dorsifixed anthers and medium 4 stamens with erect filaments upto 1 cm long and versatile, curved anthers; **pistil** with sessile or stalked, pubescent ovary, style upto 0.5 cm long and terminal stigma. Pods 40-60 cm long, indehiscent, cylindric, pendulous terete (Fig. 18).



Fig. 18. *Cassia fistula* L.

**Ecology**

Moderate sized, deciduous trees distributed throughout the State and is also

cultivated as ornamental or avenue trees. The beautiful yellow flowers appear during April to June and fruits are produced by August-September which persist on the trees till the next flowering season.

**Distribution**

**Kerala**

Cannanore, Calicut, Malappuram, Palghat, Trichur, Ernakulam, Kottayam, Alleppy, Pathanamthitta, Quilon and Trivandrum districts; almost throughout the State, mainly in the midlands (Map 41).

**World**

India, Sri Lanka, Myanmar.

**Products and uses**

The pulp obtained from the cassia fruits is used as an ingredient of confection of Senna. The bark of *C. fistula*, is used extensively with Avaram bark (*Cassia auriculata* L.) in tanning industry in South India. The content of tan in the bark is almost 12% on zero moisture basis. When used alone this tan does not penetrate as quickly as Avaram bark tan. The bark also yields a red dye (Krishnamurthy, 1993). The pulp of fruit, root bark, seeds and leaves are used as laxative. Babu (1990) has also mentioned that the roots of the tree are used in the treatment of skin diseases, leprosy and also tuberculosis.

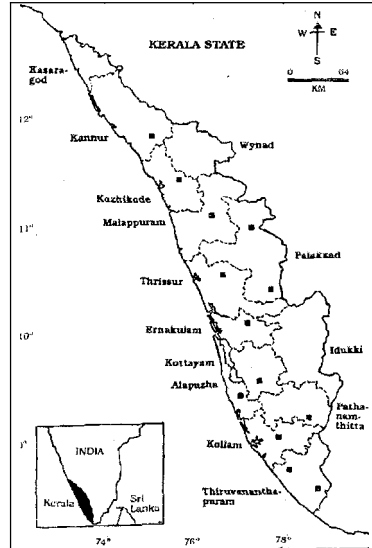
The flowers and flower buds are reported to be eaten as vegetable (Krishnamurthy, 1993) and the tree has also some devotional significance for Hindus. The yellow flowers are used to see ‘Kani’ and is considered as a symbol of prosperity.

**Production and marketing**

The bark of the tree is called Sumari in commerce, collected and marketed as a tanning material. It is in record (Anonymous, 1950) that about 10000-20000 kg of the item was collected annually from the forests of South India during that period and there is no record on the collection and marketing of the item from Kerala State with the SC & ST Federation (1998).

**Regeneration**

*C. fistula* is a light demander eventhough it can also withstand certain amount



Map 41. Distribution of *Cassia fistula* L. in Kerala

of shade. It is a frost-sensitive species but draught hardy and is not usually browsed. Natural reproduction of the plant is by seeds, which fall on ground as pods and then rind and pulp of pods eaten away by ants or other animals. Seeds buried partially and covered by moderate growth of grass, germinate better than exposed ones.

Ripe pods available during March-April can be collected and seeds extracted from them for the artificial regeneration of the species. The seeds can also be stored for many years (Dent, 1948) without losing viability. In fact, seeds stored for a year give better germination than fresh ones (FRI, 1983). About 6000-7000 seeds weigh one kilogram and germination rate varies from 22-60% and plant percent is between 12 and 47. Pretreatments with hot water, sulphuric acid, etc is also reported (FRI, 1983) for the improvement of germination rate. Seeds can be sown during March-April in the nursery beds, in drills, 25 cm apart. Within 6-52 days, germination will be completed. During the first rains, when seedlings attain a height of 15-30 cm, transplanting can be done and container seedlings are reported to be better than naked plants (FRI, 1985). Direct seed sowing, entire planting with a ball of earth around the root system and stump planting are also methods proved successful for the artificial regeneration of the species. Among them, stump-planting is the best method (Kadambi and Dabral, 1955).

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- Dent, T.V. 1948. The storage of seeds of Indian forest plants. *Indian Forest Records- New Series* 7(1) *Silviculture*. Manager of Publications, New Delhi.
- FRI, 1983. *Troup's Silviculture of Indian Trees*. vol. 4. Controller of Publications, Delhi. pp. 109-113.
- Kadambi, K. and S.N. Dabral 1955. Studies on the suitability of different methods for artificially regenerating forest species. *Indian For* 81: 129-159.
- Kerala State SC & ST Federation 1998. Different items of LFPP handled during 1994-95 to 1996-97 and price fixed by MFP Committee per kilogram for 1997-98. Trivandrum (unpublished).
- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi. pp. 188, 347.

## 42. CHIMONOBAMBUSA DENSIFOLIA (MUNRO) NAKAI (Bambusaceae)

### Nomenclature

*Chimonobambusa densifolia* (Munro) Nakai, J. Arn. Arbor. 6: 151. 1925; Var. *et* Bah., Indian For. Rec. (n.s.) Bot. 6(1):2. 1980; Bah. *et* Jain, Indian J. For. 4: 283. 1981; Tew., Monogr. Bamb. 55. 1992.

*Arundinaria densifolia* Munro, Trans. Linn. Soc. London 26: 32. 1868; Gamble, Ann. Roy. bot. Gardn. Calcutta 7: 8. t. 7. 1896 & in Hook. f., Fl. Brit. India 7: 379. 1897; Rama Rao, Fl. Pl. Trav. 446. 1914; Fisch. in Gamble, Fl. Presid. Madras 3: 1857. 1934.

### Local name(s)

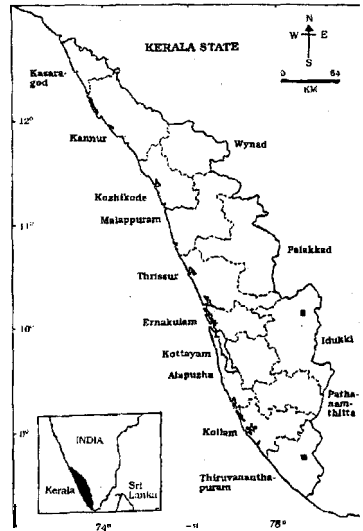
Not known.

### Description

Shrubby bamboos, 20-85 cm high with thick rhizomes covered by imbricate scales; **culms** about 1 cm in diameter, smooth with prominent nodes and 2-3 branches per node; **culm-sheath** upto 2.5 cm in diameter, striate, hirsute with pointed auricles. **Leaves** upto 3.5 x 0.5 cm, subsessile, lanceolate, spinulose-serrate along the edges, shiny with prominent main vein and two pairs of inconspicuous secondary veins; **leaf-sheath** striate, stiff hairy, ciliate along the edges; **ligules** short, round, hairy. **Flowers** (spikelets) upto 1 cm long in dense racemose panicles on leafy branchlets; **glumes** 2 empty, 1 fertile and 1 imperfect; **palea** upto 0.8 cm long with keels ciliate and one-nerved on either side, bimucronate and ciliate at apex; **stamens** with short filaments and bifid basifixed anthers; **pistil** with elliptic ovary, style divided to the base and the stylar branches ending in plumose stigma.

### Ecology

This bamboo species is rather rare in the high altitude grasslands of Kerala, around Anamudi in the high ranges near Munnar, sometimes forming pure patches. Flowering of the species was reported to be September in 1890 (Gamble, 1896).



Map 42. Distribution of *Chimonobambusa densifolia* (Munro) Nakai in Kerala.

### Distribution

#### Kerala

Idukki and Trivandrum districts; confined to the grasslands of the highlands of the State (Map 42).

#### World

Southern Peninsular India, Sri Lanka.

### Notes

This bamboo species has not been dealt with by Krishnamurthy (1993) as a non-wood forest produce. Even though Tewari (1992) reported this species from southern Peninsular India only, Bahadur and Jain (1981) had mentioned about the occurrence of the species in Sri Lanka, where it is more common.

### Products and uses

The slender culms of this bamboo are used for making baskets and for fencing. Also a fodder bamboo, especially for ponies in the rainy season, when other fodder grasses are scarce.

### References cited

- Bahadur, K.N. and S.S.Jain 1981. Rare bamboos of India. *Indian J. For.* 4: 280-286.
- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi.
- Tewari, D.N. 1992. *A Monograph on Bamboo*. International Book Distributors, Dehra Dun. pp. 55-56.

## 43. CHUKRASIA TABULARIS JUSS. (Meliaceae)

### Nomenclature

*Chukrasia tabularis* Juss., Mem. Hist. Nat. Paris 19:251. t. 22. 1831 (as *Chikrasia*); Bedd., Fl. Sylvat. South. Ind. t. 9. 1869; Hiern in Hook.f., Fl. Brit. India 1: 568. 1875; Bourd., For. Trees Trav. 90. 1908; Rama Rao, Fl. Pl. Trav. 77. 1914; Gamble, Fl. Presid. Madras 1: 186. 1915; Krishnam., Min. For. Prod. India 249, 329. 1993.

### Local name(s)

Akil, Chuvanna-akil, Mala-veppu.

### Description

**Trees**, 10-20 m high; **branchlets** lenticellate, glabrous. **Leaves** alternate or subopposite, abruptly pinnate, 20-35 cm long; **leaflets** 5-8 pairs, 5-12 x 2-6.5 cm, ovate or ovate-oblong, entire, glabrous above, unequal at base, acumi-

nate at apex; **petiolules** upto 1 cm long, pubescent. **Flowers** yellow in large, spreading terminal panicles, shorter than the leaves; **calyx** short, obtusely 5-toothed, pubescent externally; **corolla** of 5 oblong, spatulate petals, upto 1.5 cm long, erect and contorted; **stamens** 10, tubular, glabrous, shortly 10-toothed at apex with 10 erect anthers, inserted within the teeth and exserted; **pistil** with cylindric, shortly stalked, hairy, 3-5 loculed ovary, short style and 4-lobed stigma, projecting beyond the staminal tube. **Capsules** upto 5 cm long, ovoid or obovoid, woody with numerous winged seeds.

### Ecology

Graceful, stunted trees, rather rare in the moist deciduous forests of Kerala. Flowers during February to April and fruits ripen and seeds get dispersed by July.

### Distribution

#### Kerala

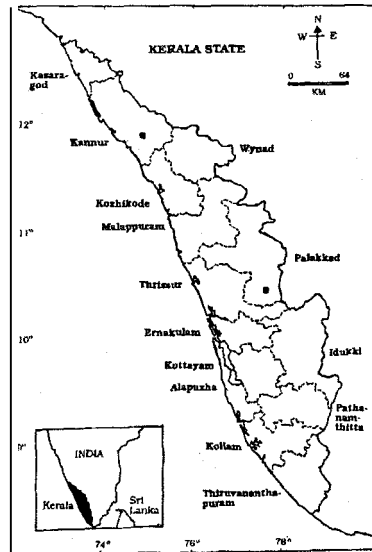
Cannanore and Palghat districts; confined to the highlands of northern Kerala (Map 43).

#### World

India, Sri Lanka, Myanmar.

### Products and uses

The bark of the tree yields a reddish to amber coloured gum used as an adhesive. Therefore, the tree is called Redakil. The bark and the young leaves also contain about 15% and 22% of tannin (Krishnamurthy, 1993), respectively. Medicinally the bark is reported to be an astringent.



Map 43 Distribution of *Chukrasia tabularis* Juss in Kerala

### Regeneration

The tree regenerates well from fallen seeds in the natural forests. However, casualty of seedlings in their early stages of development is a common phenomenon (FRI, 1981) due to draught or excessive moisture (Luna, 1996).

Artificial regeneration of the species can be done by seeds. Ripened fruits can be collected from natural stands and sun-dried for 3-5 days when they dehisce. About 8 kg of fruits give one kilogram of cleaned seeds. The seeds further sun-dried for few more days, can be stored for few months. However, long storage of seeds affect their viability. Data from different States in India (FRI, 1981) shows that one kilogram of seeds contain 71,000 to 99,000

numbers. In the nursery, seeds can be broadcast sown by January-February at the rate of 30 gm/m<sup>2</sup> of the nursery bed. Germination percent of seeds reported (FRI, 1981) from Tamilnadu State is about 36 and plant percent 34. However, the germination rate can reach upto 90%, as reported from Assam (FRI, 1981). It takes 7-40 days for the germination of seeds. In order to avoid crowding of seedlings in the bed leading to casualties, they can be pricked out when 5-8 cm high, to another shaded bed. During June-July, the seedlings will be ready for transplanting and about 90% of the transplants survive (FRI, 1981). Also, removing shade about 2 weeks before transplanting will ensure better survival of outplanted seedlings. Stump-planting is also reported to be a successful method (Luna, 1996).

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- Luna, R. K. 1996. *Plantation Trees*. International Book Distributors, Dehra Dun. pp. 266-269.

## 44. CINNAMOMUM MALABATRUM (BURM.F.) BL. ( Lauraceae )

### Nomenclature

- Cinnamomum malabattrum* (Burm.f.) Bl., Rumph. 1: 38. 1836; Kosterm., Bull. bot. Surv. India 25: 102. 1983; Nicol. *et al.*, Intrap. Hort. Malab. 157. 1988.
- Laurus malabattrum* Burm.f., Fl. Ind. 92. 1768 (*pro parte, quoad cit. Katou-karuva* Rheede).
- Cinnamomum malabathrum* (Lamk.) Persl in Bercht. *et* Persl, Prizr Rostlin. 2. 36. & 46. 1825.
- Laurus malabathrica* Soland. *ex* Roxb., Hort. Beng. 30. 1814. & Fl. Indica 2: 297. 1832; Kosterm., Reinwardtia 8: 33. 1970.
- Cinnamomum iners* auct. (*non* Reinw. *ex* Bl.); Nees in Wall., Pl. Asiat. Rar. 3: 32. 1832 (*nee. alior; pro parte, quoad cit. Wight s.n.*).
- Cinnamomum zeylanicum* auct. (*non* Bl.); Wt., Ic. Pl. Ind. Orient. t. 123. 1843; Bedd., Fl. Sylvat. South. Ind. t. 262. 1872; Hook.f. in Hook.f., Fl. Brit. India 5: 131. 1890; Bourd., For Trees Trav. 301. 1908; Rama Rao, Fl. Pl. Trav. 341. 1914; Gamble, Fl. Presid. Madras 2: 1224. 1924 (*pro parte*); Krishnam., Min. For. Prod. India 18, 42, 43, 157. 1993.
- Laurus culitlawan* Wt. *ex* Meissner in DC., Prodr. 15 (1): 20. 1864.

### Local name(s)

Kattu-karuva, Kattu-karuva-patta.



## Description

**Trees**, 15-20 m high; **bark** smooth, upto 1 cm thick, pale brown externally, whitish inside, aromatic, brittle when dry; **branchlets** densely subappressed pilose. **Leaves** simple, opposite or subopposite, 9-20 x 2.5-5 cm, elliptic, oblong or subovate-elliptic, acute or cuneate at base, attenuate-acuminate or acute-acuminate at apex, prominently 3-nerved at base; **petioles** 0.5- 1.8cm long, glabrous. **Flowers** pale or greenish white in lax, terminal panicles upto 25 cm long; **tepals** 0.2-0.3 cm long, ovate, fleshy, acute; **stamens** 9 perfect, 0.2-0.3 cm long with 4-loculed anthers oblong or subovate-oblong, acute, arranged in three whorls; **staminodes** less than 0.2 cm long, hastate, cordate; **pistil** with ellipsoid ovary upto 0.2 cm long, cylindrical style and small, peltate stigma. **Fruits** upto 1 cm long, seated on an ellipsoid, fleshy, upto 0.7 cm long cup.

## Ecology

Medium-sized, graceful trees with dense crown, fairly common in the valleys, along stream-sides and in open areas of semi-evergreen and moist deciduous forests of Kerala: Flowers during December to March and fruits are borne during March to May.

## Distribution

### Kerala

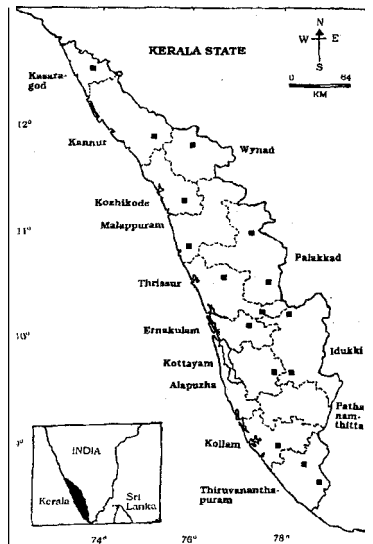
Kasaragod, Cannanore, Wynad, Calicut, Malappuram, Palghat, Trichur, Ernakulam, Kottayam, Idukki, Quilon and Trivandrum districts; throughout the State, mostly from the mid to the highlands (Map 44).

### World

Peninsular India, Sri Lanka.

## Notes

In the Western Ghats of Peninsular India, there are two types of wild Cinnamons. Kostermann (1983) has given a detailed discussion on their identity, nomenclature, products, and so on. In the present context, it may be mentioned that *Caruva* plant depicted by Rheede (1684) includes a mixture of two species, viz. the Sri Lankan Cinnamon (*Cinnamomum verum* Persl, syn. *Cinnamomum zeylanicum* Bl.) and *Cinnamomum goaense* Kosterm. *Katu-karuva* of Rheede (*Hort. Malab.* 5. 105. t. 53. 1684) which is the plant delt with here is *Cinnamomum malabatum*. Yet another species whose bark



Map 44 Distribution of *Cinnamomum malabatum* (Burm.f.) BI in Kerala

also is exploited as that of *Cinnamomum malabattrum* is *Cinnamomum macrocarpum* Hook. f., which is confined to higher elevations of Nilgiri mountains in the Western Ghats of Peninsular India. The products from all the three species were traded in the name Malabar Cinnamon during ancient times and details on the exact differences of the products, if any, from anatomical and chemical angles are not available.

### Products and uses

The aromatic bark of the tree is much extracted for medicinal purposes. The bark is known to be astringent, laxative, stimulant, carminative, antispasmodic, and so on. Bark oil has similar medicinal properties and is also used in perfumery and as a flavouring agent in medicines (Krishnamurthy, 1993). Bark is also used as condiment. Oil from the leaves called 'clove oil' is used against tooth ache, head ache and rheumatism. Leaves as such are also used to preserve tamarind.

### Production and marketing

This wild species of *Cinnamomum* is the source of Vazhana-pooovu, a forest produce collected from the natural forests of Kerala. During 1994-95 to 1996-97, the Kerala State SC & ST Federation (1998) received about 2096 kg of the product from its network of collection points in Kerala at a cost of Rs. 57.00 per kg which was sold for Rs. 60.00 per kilogram. There is no information available on its country-level production or marketing and whatever data is in record is that of the Cinnamon of commerce (*Cinnamomum verum* J.S. Presl), a species mainly in cultivation in the non-forest areas of the country for its bark, flowers and leaf-oil (Shiva, *et al.* 1996).

### References cited

- Kerala State SC & ST Federation 1998. Different items of LFPP handled during 1994-95 to 1996-97 and price fixed by MFP Committee per kilogram for 1997-98. Trivandrum (unpublished).
- Kostermans, A.J.G.H 1983. The South Indian species of *Cinnamomum* Schaeffer (Lauraceae). *Bull. bot. Surv. India* 25: 98-133.
- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi. pp. 42-43.
- Rheede, H. A. van 1684. *Hortus Indicus Malabaricus*. vol. 5. Bishen Singh Mahendra Pal Singh, Dehra Dun. p. 105 (reprint).
- Shiva, M.P., Saritha Aswal, Abha Sharma, Pravin Mathur and Rakesh Chandra 1996. *Trends of Export and Import of Minor Forest Products in India*. Centre for Minor Forest Products, Dehra Dun. 38 p.

## 45. CINNAMOMUM SULPHURATUM NEES (Lauraceae)

### Nomenclature

*Cinnamomum sulphuratum* Nees in Wall., Pl. Asiat. Rar. 2: 74. 1831; Bedd., Fl. Sylvat. South. India t. 184. 1872; Hook.f. in Hook.f., Fl. Brit. India 5: 132. 1886; Bourd., For. Trees Trav. 302. 1908; Rama Rao, Fl. PI. Trav. 342. 1914; Gamble, Fl. Presid. Madras 3: 1255. 1925; Kosterm., Bull. bot. Surv. India 25: 114. 1983.

*Laurus cassia* Heyne ex Nees in Wall., Pl. Asiat. Rar. 2: 74. 1831.

*Cinnamomum macrocarpum* auct. (non Hook.f.); Sald. et Nicol., Fl. Hassan Dist. 46. 1976.

### Local name(s)

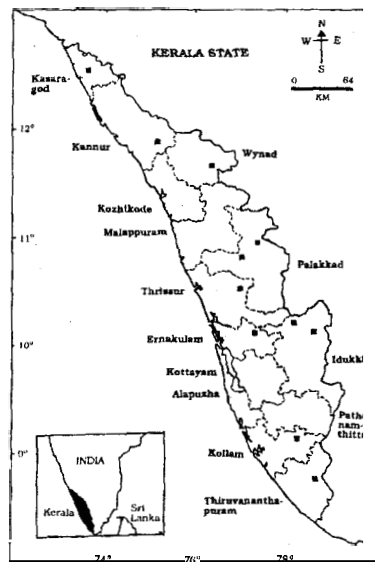
Elavarangam.

### Description

**Trees**, upto 7.5 m high; **branchlets** slender, angular, densely and minutely subappressed fulvous-pilose. **Leaves** simple, opposite or subopposite, 2.5-5.5 x 4-20 cm, ovate-elliptic, lanceolate-elliptic or elliptic, subcoriaceous, prominently nerved on both sides, narrowed towards base, obtusely acuminate at apex; **petioles** upto 1 cm long, flat or obscurely concave above. **Flowers** dull or greenish white in 8-14 cm long, lax, few-flowered axillary panicles towards the apex of terminal branchlets, densely and minutely fulvous subtomentellous; **pedicels** upto 0.5 cm long, slender; **perianth** tubular, funnel shaped, upto 1.2 cm long; **tepals** 0.2-0.3 cm long, thick, ovate, densely appressed pilose, acute at apex; **stamens** 9 perfect, upto 0.2 cm long with oblong, 4-lobed anthers and narrowly sagitate, stipitate, pilose staminodes; **pistil** with ellipsoid ovary and peltate stigma. **Fruits** upto 1-1.5 cm long, cup-shaped with persistent, fleshy tepals at base.

### Ecology

Stunted, evergreen trees, rather rare in the deciduous forests of Kerala, mostly



Map 45. Distribution of *Cinnamomum sulphuratum* Nees in Kerala.

in open areas, reed breakes, river valleys, and such habitats. Flowers during January to April and fruits mature during September to December.

### Distribution

#### Kerala

Kasaragod, Cannanore, Wynad, Palghat, Trichur, Ernakulam, Idukki, Quilon and Trivandrum districts; throughout the State, mostly in the highlands (Map 45).

#### World

Peninsular India.

### Notes

Kostermans (1983) had elucidated the synonymy of the species and cleared the confusion that existed on the identity of this taxon and allied species like *C. macrocarpum* (Burm.f.) Bl.

### Products and uses

Bark and leaves of the tree are much extracted for their medicinal and aromatic properties, especially as a carminative and stimulant. Seeds are also medicinal curing dysentery and cough, particularly of children. It is the oil distilled from leaves (Nambiar, *et al.*, 1985) which is a powerful stimulant.

### References cited

- Kostermans, A.J.G.H. 1983. South Indian species of *Cinnamomum* Schaeffer (Lauraceae). *Bull. bot. Surv. India* 25: 96-131.
- Nambiar, V.P.K., N. Sasidharan, C. Renuka and M. Balagopalan 1985. Medicinal Plants of Kerala Forests. *KFRI Research Report No. 42*. KFRI, Peechi. p. 115

## 46. CISSAMPELOS PAREIRA L. (Menispermaceae)

### Nomenclature

- Cissampelos pareira* L., var. *hirsuta* (Buch.-Ham. *ex DC.*) Forman, *Kew Bull.* 22: 356. 1968; Pram. in Sharma *et al.* (ed.) *Fl. India* 1: 315. 1993.
- Cissampelos hirsuta* Buch.-Ham. *ex DC.*, *Syst. Nat.* 1: 535. 1817.
- Cissampelos pareira* L., Sp. Pl. 1031. 1753 (*proparte, quod basionym*); Hook.f. *et Thorns.* in Hook.f., *Fl. Brit. India* 1: 103. 1872; Rama Rao, *Fl. Pl. Trav.* 12. 1914; Diels in *Engl., Pflanzenr.* 46: 286. 1910; Dunn in Gamble, *Fl. Presid. Madras* 1: 30. 1915; Krishnam., *Min. For. Prod. India* 44. 1993.
- Cissampelos convolvulacea* Willd., Sp. Pl. 4: 833. 1805; Wt. *et Arn.*, *Prodr.* 14. 1834.

**Local name(s)**

Kattu-valli, Malathangi, Pattu-valli.

**Description**

Woody **twiners**, 4-6 m high with striate branches; **branchlets** hairy or glabrous. **Leaves** simple, alternate, 3-5.5 x 2- 4.5 cm, ovate or reniform-orbicular, ciliate along the margins, pale green, glabrous or stellate-pubescent beneath, palmately 5-7 nerved, peltate, truncate or subcordate at base, acute or obtuse and mucronate at apex; **petioles** 2-5.5 cm long, slender, pubescent or puberulous; **male flowers** pale white or yellowish, minute, in lax, branched, axillary, subpendulous, corymbose cymes with slender peduncles; **female flowers** yellowish in axillary umbels or short racemes with leafy reniform, hairy bracts; **calyx** with 4, ovate-spathulate, toothed, sepals, hairy outside in female flowers; **corolla** cup-shaped, shorter than the sepal lobes; **stamens** 4 in slender, upto 1 cm long staminal column, transversely dehiscent; **pistil** with ovoid, gibbous, silky pubescent or pilose ovary and glabrous style with 3-fid stigma. **Drupes** red, upto 0.5 cm long, subglobose or obovoid, somewhat compressed, hairy with stylar scar at the base; **seeds** minute, horse-shoe shaped.

**Ecology**

Slender, shrubaceous climbers on hedges and low supports in open forest areas, especially along stream banks. Flowers which are produced almost throughout the year and especially during November to March, vary in colour from yellow to pale yellow, creamy white, greenish white, and so on. Similarly, fruits produced mostly during February to August also vary in colour like, red, scarlet, orange-coloured, etc. As such, the leaves of this plant are also very variable in size and shape.

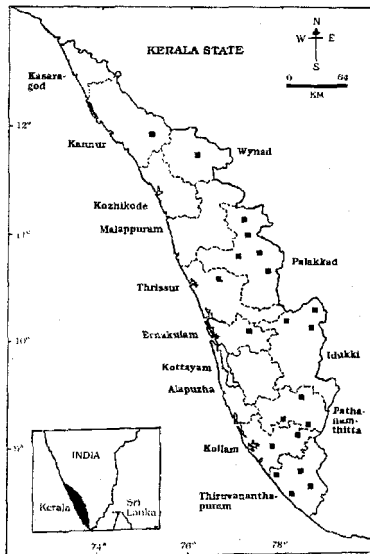
**Distribution**

**Kerala**

Cannanore, Wynad, Palghat, Trichur, Ernakulam, Idukki, Pathanamthitta, Quilon and Trivandrum districts; almost throughout the State (Map 46).

**World**

India, Pakistan, Nepal, Bhutan, Bangladesh to Malesia.



Map 46. Distribution of *Cissampelos pareira* L. var. *hirsuta* in Kerala.

### Products and uses

Roots, leaves and bark which yield a strong fibre, are the useful parts of this plant. Light brown roots with longitudinal grooves, transverse constrictions and yellowish core are medicinal, used in the treatment of diarrhoea, dysentery, cough, urinary infections (Krishnamurthy, 1993) and also as a fish poison. The leaves are curative for itches and sores and are also reported (Nambiar, *et al.* 1985) to be used in the treatment of venereal diseases and heart complaints. Pramanik (1993) has mentioned that leaves and roots of the plant are used as an antidote for snake-bite and scorpion sting.

### References cited

- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi. p. 44.
- Nambiar, V.P.K., N. Sasidharan, C. Renuka and M. Balagopalan 1985. Medicinal Plants of Kerala Forests. *KFRZ Research Report No. 45*. KFRI, Peechi. p. 3.
- Pramanik, A. 1993. Family *Menispermaceae*. In: B.D. Sharma, *et al.* (ed.) *Flora of India*. vol. 1. Botanical Survey of India, Calcutta. p. 317.

## 47. CISSUS QUADRANGULARIS L. ( Vitaceae )

### Nomenclature

*Cissus quadrangularis* L., Syst. Nat. ed. 12, 2: 124. 1767; Gamble, Fl. Presid. Madras 1: 233. 1918; Suesseng. in Engl. & Prantl, Pflanzenfam. 20d: 262. 1953; Shetty *et* Singh, Taxon 37: 172. 1988; Nicol. *et al.*, Intrap. Hort. Malab. 269. 1988.

*Vitis quadrangularis* (L.) Wall. *ex* Wt., Cat. No. 26. 1833; Wt. *et* Arn., Prodr. 125. 1834; Wt., Ic. Pl. Ind. Orient. t. 31. 1838; Laws. in Hook.f., Fl. Brit. India 1: 645. 1875; Rama Rao, Fl. Pl. Trav. 89. 1914.

*Cissus edulis* Dalz., J. Bot. Kew Gard. Misc. 9: 248. 1857.

### Local name(s)

Changalam-paranda.

### Description

Succulent, rambling **undershrubs**, upto 6 m high; **stem** green, terete, glabrous, winged along the ridges, sometimes leafy, contracted, with simple wiry tendrils at nodes. **Leaves** simple, alternate, upto 7.5 x 7 cm, ovate, suborbicular or subreniform, entire, 3-lobed or serrate along the margins, glabrous, cordate, rounded, truncate or cuneate at base, obtuse or acute at apex; **petioles** upto 1.5 cm long. **Flowers** yellowish-red is leaf-opposed, peduncled, umbellate, spreading cymes; **calyx** tubular, cupular, truncate or

obscurely 4-lobed; **corolla** with 4 petals, each upto 0.3 cm long, ovate oblong, hooded at apex; **stamens** 4, with filaments upto 0.2 cm long and free, oblong anthers; **pistil** with 2-loculed ovary, short, stout style and simple stigma. **Berries** red, upto 0.5 cm long, obovoid or globose, apiculate at apex; **seeds** black, smooth (Fig. 19).



Fig. 19. *Cissus quadrangularis* L.

**Ecology**

Tendrils climbers with green, succulent stems, common along hedges and similar low supports. It is rather rare, in forests outskirts and scrub jungles. The plant flowers during January to April and fruits ripen by April-May.

**Distribution**

Kerala

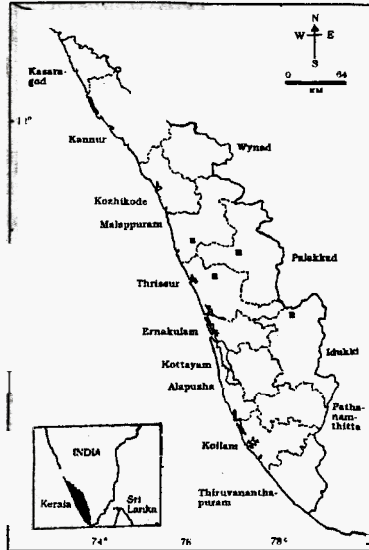
Malappuram, Palghat, Trichur, Idukki and Trivandrum districts, mostly in the midlands; sometimes cultivated (Map 47).

World

India and Sri Lanka to Africa, Arabia, Bangladesh, Java and Philippines.

**Products and uses**

Fleshy stems and leaves are the main parts of the plant extracted for medicinal uses. Also, the stem and roots yield fibrous material. Ash made of the plant material is also reported to be a substitute for baking powder (Anonymous, 1950). The presence of calcium oxalate crystals, especially on the young stems of the plant causes irritation to the skin. The tender stems and leaves, rich in vitamin C, are also used in making curries.



Map 41 Distribution of *Cissus quadrangularis* L. in Kerala.

**Production and marketing**

The green, quadrangular stem of the plant is the medicinal product extracted and marketed. To market it fresh from collection sites, the product is mostly

sold to medicinal plants procuring shops and therefore, only very little quantity of it is handled by the the Kerala State SC & ST Federation (1998), on which also, there is no authentic data maintained by them. The Federation is handling the product at a cost of Rs. 5.00 per kg as the selling price.

### References cited

Anonymous, 1950. *The Wealth of India: Raw Materials*. vol. 2. CSIR, New Delhi. p. 184.

Kerala State SC & ST Federation 1998. Different items of LFPP handled during 1994-95 to 1996-97 and price fixed by MFP Committee per kilogram for 1997-98. Trivandrum (unpublished).

## 48. COCHLOSPERMUM RELIGIOSUM (L.) ALSTON ( Cochlospermaceae )

### Nomenclature

*Cochlospermum religiosum* (L.) Alston, Handb. Fl. Ceylon 6: 14. 1931; Paul *et* Nayar, Fasc. Fl. India 19: 16-19, fig. 3. 1988; Krishnam., Min. For. Prod. India 250, 398. 1993.

*Bombax religiosum* L., Sp. Pl. 512. 1753 (as *religiosa*).

*Bombax gossypium* Cav., Diss. Bot. 5: 297. t. 156.

*Cochlospermum gossypium* DC., Prodr. 1: 527. 1824; Hook.f. *et* Thoms. in Hook.f., Fl. Brit. India 1: 190. 1874; Bourd., For. Trees Trav. 16, add. 1908; Rama Rao, Fl. Pl. Trav. 22. 1914; Dunn in Gamble, Fl. Presid. Madras 1: 50. 1915.

### Local name(s)

Apakudukka, Apparutakka, Panyara, Parei-panji.

### Description

**Trees**, upto about 10m high; **branches** crooked. **Leaves** alternate, palmately lobed 6-25 x 7-20 cm, undulate along the margins, densely tomentose when young, upper surface glabrous when mature, cordate at base, lobes acute or acuminate at apex; **petioles** 0.5-2 cm long, tomentose or glabrous when mature. **Flowers** golden-yellow, in simple racemes or loosely branched terminal panicles; **pedicels** 2-3 cm long, tomentose; **calyx** 2-3 cm across, with 5 sepals, each 3-2.5 cm long, deltoid-ovate, hairy, acute at apex; **corolla** of petals, each 3-5 x 2-2.5 cm, obovate, glabrous, notched at apex; **stamens** numerous on an eglandular disc with filaments upto 1 cm long, unequal and 5, recurved, falcate, orange-coloured anthers; **pistil** with globular ovary, upto 2 cm long, glabrous style and minutely denticulate stigma. **Capsules** 5-10 cm long, obovate, 5-valved; **seeds** brownish, 0.4 cm long, reniform to cochleate, woolly-hairy.



**Ecology**

This tree, mostly deciduous during January-March, rarely occurs in the moist deciduous forests of Kerala, in gravelly soil. Flowers are produced during January to March when the trees are leafless and fruits mature by April-June, before the new leaves start sprouting. It is an ornamental tree for its attractive yellow flowers, often planted in gardens and temple premises.

**Distribution**

Kerala

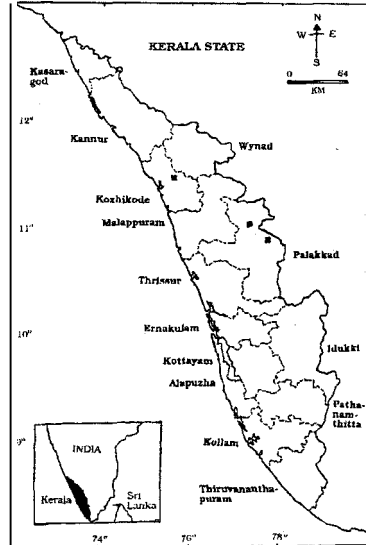
Calicut and Palghat districts; restricted to the highlands of northern Kerala (Map 48).

World

India, Sri Lanka, Malaysia.

**Prodcuts and uses**

Kutava gum is produced by this tree (Paul and Nayar, 1988). The gum is exuded from the deeply furrowed, fibrous bark of the tree. It is very similar to Kadiya (Karaya) gum obtained from *Stercuria urens* Roxb. The gum, pale, semi-transparent and transversally striated, is used in cigar-paste and ice-cream preparation. The gum is also a substitute for Tragacanth in calico-printing, marbling paper and for leather dressing. Tusar silk is also polished with the gum. Medicinally, the gum - sweetish, cooling and sedative - is useful against cough. The dried leaves and flowers are also reported to be stimulants (Anonymous, 1950). The floss is also used for stuffing pillows, lifebelts, mattresses, etc. The brown seed oil also finds its use in soap industry and the oil cakes constitute a cattle-feed. The bark also yields a fibre used in cordage.



Map 48. Distribution of *Cochlospermum religiosum* (L.) Alston in Kerala

**Regeneration**

The tree is a light demander and is draught and fire hardy. In natural conditions, it regenerates from seeds and also by coppices. The fruits ripen during May-June and the seeds are carried away to distances by wind, where they germinate. Branches also root easily when planted during rainy season (Luna, 1996).

For artificial regeneration of *C. religiosum*, fruits collected during May-June from standing trees or from the ground below are kept open and seeds

moved by thrashing. About 134000 dry seeds weigh one kilogram. Only about 8% of the dried seeds germinate, for which they are to be soaked in warm water for 12-24 hours before sowing (Luna, 1996). Germination will be completed within 40-45 days after sowing. In the nursery, seeds are either broadcast sown or dibbled in manured beds and watered regularly. The seedlings can be pricked out into polythene bags when they are six months old. Planting is usually done in pits taken at an espacement of 2 m x 2 m x 3 m x 3 m. In the early stages of growth, weeding and clearing the area is essential for the survival and growth of outplanted seedlings. The tree is fast-growing and can attain a height of about 6.5 m within 15 years (Luna, 1996).

### References cited

- Anonymous, 1950. *The Wealth of India: Raw Materials*. vol. 2. CSIR, New Delhi. pp. 261-262.
- Luna, R. K. 1996. *Plantation Trees*. International Book Distributors, Dehra Dun. pp. 275-276.
- Paul, T.K. and M.P. Nayar 1988. Family *Cochlospermaceae*. In: M.P. Nayar, *et al.* (ed.) *Fascicles of Flora of India*. vol. 19. Botanical Survey of India, Calcutta. p. 19.

## 49. COSCINIUM FENESTRATUM (GAERTN.) COLEB. (Menispermaceae)

### Nomenclature

*Cosciniumpfenestratum* (Gaertn.) Colebr., Trans. Linn. Soc. London 13: 65. 1822; Hook. f. *et* Thoms., Fl. Indica 178. 1855 & in Hook. f., Fl. Brit. India 1: 99. 1872; Diels in Engl., Pflanzenr. 4, 94: 113. 1910; Rama Rao, Fl. Pl. Trav. 12. 1914; Dunn in Gamble, Fl. Presid. Madras 1: 27. 1915; Forman, Kew Bull. 32(2): 325. 1978; Pram. in Sharma, *et al.* Fl. India 1: 313. 1993; Krishnam., Min. For. Prod. India 347. 1993.

*Menispermum fenestratum* Gaertn., Fruct. 1: 219. t. 45. f. 5. 1788.

*Cosciniumpwallichianum* Miers, Contrib. Bot. 3: 23. 1871; Diels in Engl., Pflanzenr. 4, 94: 112. 1910.

*Cosciniumpwightianum* Miers *ex* Diels in Engl. Pflanzenr. 4, 94: 112. 1910.

### Local name(s)

Mara-mangal.

### Description

Woody **climbers**, upto 15 m high with a yellow wood sap; stem often shallowly furrowed; **branchlets** terete, obscurely ridged or smooth, brownish tomentose when young, glabrescent later, whitish with prominent disciform

petiole-scars. **Leaves** simple, alternate, upto 30 x 20 cm, broadly ovate or ovate, rarely subpanduriform with basal lateral lobes, glabrescent above, whitish tomentellus with fine reticulations below, palmately 5-7 nerved, thinly coriaceous broadly rounded, truncate, shallowly cordate or broadly obtuse at base, acuminate at apex; **petioles** 5-15 cm long, brownish tomentose first, often swollen at both ends, geniculate at base. **Flowers** greenish, dioecious, in many-flowered, racemose inflorescence of globose heads, 5-10cm long, supra-axillary or from older, leafless stems; **male flowers** sessile or shortly pedicelled with yellow tepals, densely sericeous-pilose externally, glabrous within, upto 0.2 cm long, broadly-elliptic or obovate, outermost ones smaller and 6 stamens, each 0.1 cm long; **female flowers** with tepals as in the male flowers, 6 staminodes and 3 carpels, upto 0.2 cm long, curved-ellipsoid, densely pilose with filiform style and recurved stigma. **Drupes** brown to orange or yellowish, upto 3 cm in diameter, subglobose, tomentellus, drying woody; **seeds** whitish or greenish, upto 2 cm long, subglobose, longitudinally ridged.

### Ecology

A very rare climber, confined to evergreen and semi-evergreen forest tracts of Kerala, especially near hill streams, associated with species like *Hopea parviflora* Bedd., *Elaeocarpus* spp., *Mallotus philippinensis* Muell.-Arg., *Thottea siliquosa* (Lamk.) Ding Hou, etc. Flowers and fruits during August to October.

### Distribution

#### Kerala

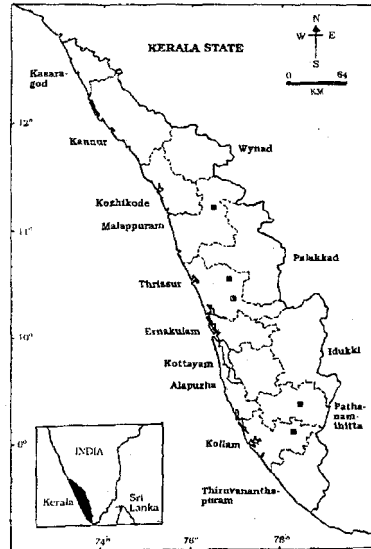
Malappuram, Trichur, Pathanamthitta, Quilon and Trivandrum districts; almost throughout the State at specific locations (Map 49).

#### World

Peninsular India, Sri Lanka, Cambodia, West Malesia.

### Products and uses

The stem of the plant yields a yellow juice which is highly medicinal with antiseptic and curative properties. The wood tincture is also used for dressing wounds, ulcers and in the treatment of debility, fever and certain types of dyspepsia. The juice is extracted by soaking wood pieces in water and crushing and squeezing (Krishnamurthy, 1993).



Map 49. Distribution of *Coscinium fenestratum* (Gaertn.) Coleb. in Kerala.

It contains about 3.5% of the alkaloid berberine (Anonymous, 1950). The root is also reported to be medicinal in the treatment of diabetes and to arrest excessive bleeding. Apart from berberine, the wood also contains, among few others, the alkaloid jatrarhizine. The stem of the plant is also exploited on a large scale for use in cosmetic industry, especially in the preparation of antiseptic and facial creams.

### Production and marketing

This valuable but rare medicinal and cosmetic plant produce of Kerala forests is collected and marketed on a large scale from the State. The Kerala State SC & ST Federation (1998) received more than 50,889 kg of the item during 1994-95 to 1996-97 through its network of collection centres in the State at a cost of Rs. 11.40 per kg which they marketed for Rs. 12.00 per kilogram. There is no recorded details on the export of the item (Shiva, *et al.* 1996) from India.

### References cited

- Anonymous, 1950. *The Wealth of India: Raw Materials*. vol. 2. CSIR, New Delhi. p. 360.
- Kerala State SC & ST Federation 1998. Different items of LFPP handled during 1994-95 to 1996-97 and price fixed by MFP Committee per kilogram for 1997-98. Trivandrum (unpublished).
- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi. p. 348.
- Shiva, M.P., Saritha Aswal, Abha Sharma, Pravin Mathur and Rakesh Chandra 1996. *Trends of Export and Import of Minor Forest Products in India*. Centre for Minor Forest Products, Dehra dun. 38 p.

## 50. COSTUS SPECIOSUS (KOEN.) SM. ( Zingiberaceae )

### Nomenclature

*Costus speciosus* (Koen.) Sm., Trans. Linn. Soc. London 1: 249. 1800; Wt., Ic. Pl. Ind. Orient. t. 2014. 1853; Baker in Hook.f., Fl. Brit. India 6: 249. 1892; Rama Rao, Fl. Pl. Trav. 403. 1914; Fisch. in Gamble, Fl. Presid. Madras 3: 1490. 1928; Holttum, Gard. Bull. Singapore 13: 242. 1950; Burt et Smith, Notes Roy. bot. Gard. Edinburgh 31: 185. 1972; Nicol. *et al.*, Intrp. Hort. Malab. 316. 1988; Krishnam., Min. For. Prod. India 47,48. 1993.

*Banksia speciosa* Koen. in Retz., Obs. 3: 75. 1783.

*Costus speciosus* var. *nepalensis* (Rosc.) Baker in Hook.f., Brit. India 6: 250. 1892.

**Local name(s)**

Ana-koova, Canna-kuva, Channa-koova, Chennakkava.

**Description**

Rhizomatous, succulent, perennial **herbs**; aerial **pseudostem** upto 2 m high, leafy, reddish, thick at base. **Leaves** simple, spiral, sheathed, 12-25 x 4.5-7.5 cm, oblong, broadly elliptic or oblanceolate, glabrous above, pubescent beneath, entire, rounded at base, acute, acuminate or often cuspidate at apex; **sheaths** coriaceous without ligules. **Flowers** white, numerous, in terminal ovoid, dense spikes upto 8.5 cm long; **bracts** bright red, upto 3 cm long, ovate, acuminate, mucronate; **bracteoles** upto 1 cm long, solitary, subtending the calyx; **calyx** tubular, 3-lobed with lobes 1.5-2.5 cm long, deltoid-ovate; **corolla** tubular below, lobed upto 3 cm long above, acuminate at apex; **labellum** white with an yellow centre, upto 4.5 cm in diameter, broadly ovate with reflexed margins; **stamens** median one perfect with a tuft of hairs at the base of the broad filament and petaloid connectives, as long as the two, linear anther locules; **pistil** with globose, 3 lobed, 3-loculed ovary, upto 3 cm long, slender style and crescent-shaped stigma with ciliated mouth. **Capsules** red, about 2 cm across, globose trigonous; **seeds** black with white aril (Fig. 20).



Fig. 20. *Costus speciosus* (Koenn) Sm

**Ecology**

Shade-loving herbs with perennating underground stem, rather common in the openings of moist deciduous, semi-evergreen and rarely dry deciduous forests, especially along the sides of rocks, stream banks and in river valleys. By the onset of monsoon, the plant sprouts and produces attractive, aerial inflorescence during August to October; seeds are produced by January-February.

**Distribution**

Kerala

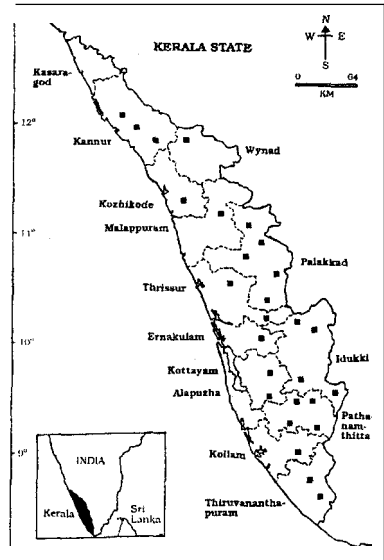
Cannanore, Wynad, Calicut, Malappuram, Palghat, Trichur, Ernakulam, Idukki, Kottayam, Pathanamthitta, Quilon and Trivandrum districts; almost throughout the State, mainly from the mid to the highlands (Map 50).

**World**

India, Sri Lanka and Malesia to New Guinea and Australia.

**Products and uses**

Rhizomes of the plant, being a valuable source of starch, are extensively extracted from the natural forests. The rhizomes are cooked and eaten or the starch-drug 'diosgenin' is extracted for consumption. It has astringent, purgative and tonic properties. The root is also medicinal as anthelmintic, stimulant and depurative. Krishnamurthy (1993) has reported that the rhizomes are used by local people in birth control measures also, on which further information is not available.



Map 50 Distribution of *Costus speciosus* (Koen) Sm in Kerala

**Reference cited**

Krishnamurthy, T 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi p. 48.

## 51. CRATAEVA NURVALA HAM. ( Capparaceae )

**Nomenclature**

*Crataeva nurvala* Ham., Trans. Linn. Soc. London 15: 121. 1827 (as 'narvala'); Bourd., For. Trees Trav. 14. 1908; Jacobs, Blumea 12: 194. 1964; Nicol. *et al.*, Intrap. Hort. Malab. 78. 1988.

*Crataeva magna* (Lour.) DC., Prodr. 1: 243. 1824.

*Capparis magna* Lour., Fl. Cochinch. 1: 331. 1790.

*Crataeva religiosa* Forst.f. var. *nurvala* (Ham.) Hook.f. *et* Thoms. in Hook.f., Fl. Brit. India 1: 172. 1872; Rama Rao, Fl. Pl. Trav. 18, 1919.

*Crataeva religiosa sensu* Dunn in Gamble, Fl. Presid. Madras 1: 47. 1915 (*pro parte, non* Forst.f. 1786); Wt., Ic. Pl. Ind. Orient. t. 16: 1838.

**Local name(s)**

Neervalam, Nir-matholam, Nirvala.

**Description**

**Trees** or rarely **shrubs**, 4- 15 m high; **branchlets** greyish-brown when dried.

**Leaves** 3-foliolate, alternate, 3-10 cm long, with a glandular knobbed rachis; **leaflets** 6-15.5 x 1-6 cm, ovate, lanceolate or obovate with reddish tinged midrib, coriaceous or chartaceous, acute, acuminate, attenuate or oblique at base, acuminate with often an acute tip at apex; **petiolules** 0.2-0.3 cm long, rarely sessile. **Flowers** greenish-white in terminal, leafy racemes, upto 10 cm long; **pedicels** 2-3.5 cm long, stout, glabrous; **calyx** with 4 sepals, each 2-3 x 1-1.5 cm, ovate, petaloid, acute; **corolla** with 4 petals, each 0.4-1 cm long, clawed, narrow; **stamens** 15-25, upto 0.2 cm long, on spreading androphores; **pistil** upto 0.5 x 0.2 cm, on 3-5.5 cm long, gynophore, ellipsoid to cylindrical with sessile, flat, distinct stigma. **Berries** 3.5-5.5 x 3-5 cm, ovoid or globose, ellipsoid, thick, on stout, 0.3-0.4 cm long, gynophore, covered with thin, dull, yellowish crust; **seeds** dark dull brown, 4.5-5.5 x 0.2-0.3 cm, embeded in pulp.

### Ecology

Stunted trees or large shrubs, rather common along stream and river banks from coastal region upto an altitude of 1000-2000m above sea level, in moist and dry deciduous forest tracts. The plant flowers during December to April and fruits mature in the rainy season, during August to October.

### Distribution

#### Kerala

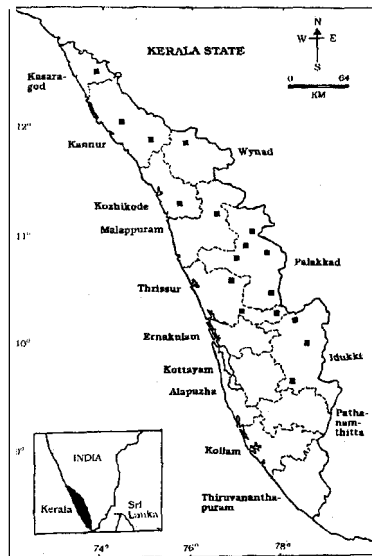
Kasaragod, Cannanore, Wynad, Calicut, Malappuram, Palghat, Trichur and Idukki districts; mostly in the northern and central parts of the State, mainly in the highlands (Map 5 1).

#### World

India, Sri Lanka, Malaysia, Indo-China, Borneo, Java, Philippines, Celebes, Molucas and New Guinea.

### Notes

*Crataeva magna* is also a recently used name for the species, even though there is still an element of doubt left unclear with regard to the identity of the type



been traced). Therefore, the binomial *Crataeva nurvala* is considered valid for the species, as accepted by Jacobs (1964) and Nicolson, *et al.* (1988) who had given a detailed discussion on the identity and nomenclature of this

### Products and uses

Bark, roots and fruits of the plant are extracted for medicinal use. Jain (1965) had reported that the bark also possesses contraceptive properties. The flowers are also reported to be used as an astringent and cholagogue.

### Regeneration

The plant is a light demander, even though it can tolerate shade to some extent. It is sensitive to frost conditions, especially during the early stages of growth. The tree coppices freely and regenerates both from seeds and by root-suckers. Seeds dispersed on bare, moist ground germinate well.

For artificial regeneration of the tree, seeds can be collected during June to September and stored up to 10 months (FRI, 1980). About 22,600 seeds weigh one kilogram. Seedlings can be raised from seeds, sown during the rains, in loose, wet soil or in containers of sufficient size to accommodate the long taproot of growing seedlings. About 7% is the recorded germination rate of seeds and it takes 20-72 days for the germination (Sengupta, 1937) to be completed. The seedlings can be field planted during the following rainy season, when they attain a height of about 15 cm. Transplanting with a ball of earth around the roots will ensure better survival of out-planted seedlings.

### References cited

- FRI, 1980. *Troup's Silviculture of Indian Trees*. vol. 2. Controller of Publications, Delhi.
- Jacobs, M. 1964. The genus *Crataeva* (Capparaceae): History and typification. *Blumea* 12: 194-1964.
- Jain, S.K. 1965. Medicinal plant-lore of the tribals of Bastar. *Eco. Bot.* 19: 236-250.
- Nicolson, H. Dan, C.R. Suresh and K.S. Manilal. 1988. An interpretation of van Rheedee's *Hortus Malabaricus*. *Regnum Vegetabile* 119. Koeltz Scientific Books, Germany, p. 78.
- Sengupta, J.N. 1937. Seed weights plant percent, etc. for forest plants in India. *Indian Forest Records - New Series* 2(5) *Silviculture*. Manager of Publications, New Delhi.

## 52. CROTON TIGLIUM L. ( Euphorbiaceae )

### Nomenclature

*Croton tiglium* L., Sp. Pl. 1004. 1753; Wt., Ic. Pl. Ind. Orient. t. 1914. 1852; Hook.f. in Hook.f., Fl. Brit. India 5: 393. 1887; Bourd., For. Trees Trav. 278. 1908; Rama Rao, Fl. Pl. Trav. 365. 1914; Gamble, Fl. Presid. Madras 2: 1315. 1925; Airy Shaw, Kew Bull. 26: 250. 1972; Nicol. *et al.*, Intrap. Hort. Malab. 108. 1988; Krishnam., Min. For. Prod. India 48. 1993.



**Local name(s)**

Kadal-avanakku, Neervalam.

**Description**

**Trees**, 6-8 m high; **branchlets** sparsely stellate-hairy. **Leaves** simple, opposite, 4.5-12.5 x 3-8 cm, ovate, elliptic or oblong, serrate, thin, glabrous, sometimes glandular beneath, 3-5 nerved and obtuse or rounded at base, acuminate at apex; **petioles** 2-4.5 cm long, slender. **Flowers** greenish-yellow, monoecious in racemes, 10-15 cm long; **pedicels** upto 3.5 cm long, stellate-hairy; **male flowers** pale green, upto 0.8 cm long; **calyx** of 5 or rarely 4-6 glabrous sepals; **corolla** with 5 or rarely 4-6 narrow, woolly edged petals; **stamens** 15-25 with glabrous, free filaments and adnate anthers; **female flowers** with sepals sparsely hairy at base, trigonous, stellate-hispid ovary, slender style and 2-4 cleft stigma. **Capsules** 2-2.5 cm long, white, obovoid, obtusely trigonous with 3 cocci; **seeds** obtusely trigonous, glabrous.

**Ecology**

Stunted trees, rather rare in the moist deciduous forests of Kerala at low and medium elevations and sometimes grown in gardens or as support or shade trees in pepper plantations, as seen in Wynad and Palghat. Flowers are produced during August to January and fruits mature by April-May.

**Distribution****Kerala**

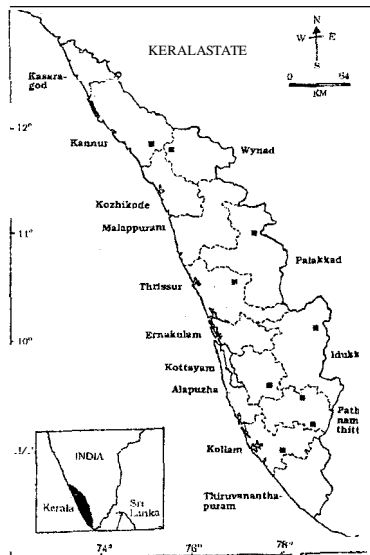
Cannanore, Wynad, Palghat, Trichur, Idukki, Kottayam, Pathanamthitta and Quilon districts; almost throughout the State, mainly from the mid to the highlands (Map 52).

**World**

India, Sri Lanka and Myanmar to Malaysia and China.

**Products and uses**

Seeds of the tree are collected for extraction of oil, known as Croton oil, which is medicinally used as a very drastic purgative (Krishnamurthy, 1993) and as a rubefacient. Therefore, the plant is also sometimes called Purg-ing croton. The oil is solvent extracted and is light yellow in colour. The oil contains a toxic resin with blistering action (Anonymous, 1950).



Map 52 Distribution of *Croton tiglium* L. in Kerala.

### Production and marketing

Dried seeds of the plant is the product collected and marketed from the natural forests of Kerala. The apex NWFP collection and disposal body of the State, namely the Kerala State SC & ST Federation (1998), had not recorded the actual quantity of the product that was available to them during 1994-95 to 1996-97, even though the purchase rate of the item is fixed as Rs. 5.70 per kg and selling cost as Rs. 6.00 per kilogram.

### References cited

- Anonymous, 1950. *The Wealth of India: Raw Materials* vol. 2. CSIR, New Delhi. p. 383.
- Kerala State SC & ST Federation 1998. Different items of LFPP handled during 1994-95 to 1996-97 and price fixed by NFP Committee per kilogram for 1997-98. Trivandrum (unpublished).
- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi. p. 48.

## 53. CURCULIGO ORCHIOIDES GAERTN. ( Hypoxidaceae )

### Nomenclature

*Curculigo orchioides* Gaertn., Fruct. 1: 63. t. 16. 1788; Roxb., Pl. Corom. t. 13. 1795; Wt., Ic. Pl. Ind. Orient. t. 2043. 1853; Hook.f. in Hook.f., Fl. Brit. India 6: 279. 1892; Rama Rao, Fl. Pl. Trav. 106. 1914; Fisch. in Gamble, Fl. Presid. Madras 3: 1502. 1928; Nicol. *et al.*, Intrap. Hort. Malab. 294. 1988; Krishnam., Min. For. Prod. India 191. 1993.

*Curculigo malabarica* Wt., Ic. Pl. Ind. Orient. 6: 22. t. 2043. 1853 (*pro parte*).

### Local name(s)

Nilappana, Nilappana-kizhangu.

### Description

Tuberous **herbs** with elongated rootstock. **Leaves** basal, sheathed, plicate or flat, 5-20 x 0.6-1.5 cm, lanceolate, prominently nerved from the base, entire, densely or sparsely pubescent to subglabrous, narrowed at base, acuminate at apex; **petioles** upto 2.5 cm long with persistent leaf sheath. **Flowers** yellow, sessile, in racemose scapes, upto 6 cm long; **bracts** upto 0.8 cm long, lanceolate, glabrous, acute at apex; **perianth** 6-lobed, upto 1 cm long, oblong-elliptic; **stamens** 6 with filiform, upto 0.2 cm long filaments and anthers as long as the filaments; **pistil** upto 0.5 cm long with oblong, 3-loculed ovary, filiform style and 3-lobed stigma. **Fruits** almost 1 x 0.5 cm, oblong, glabrescent; **seeds** 1-4 or 8, upto 0.2 cm across, globose, beaked.

**Ecology**

Ground herbs with yellow flowers, common in dry forest floor, grassy areas, along river banks and such habitats of the deciduous forest tracts of Kerala. Also, the species is common along roadsides, barren lands and waste places, elsewhere. Flowering scapes emerge during February to May and by September-October, the fruits mature.

**Distribution**

**Kerala**

Kasaragod, Cannanore, Wynad, Calicut, Malappuram, Palghat, Trichur, Ernakulam, Idukki, Kottayam, Pathanamthitta, Quilon and Trivandrum districts; throughout the State (Map 53).

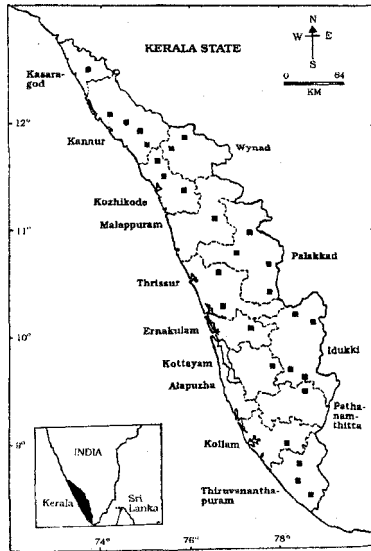
**World**

India, Sri Lanka, Malesia, Australia.

**Products and uses**

The tuberous roots of the plant, collected after two years of growth, are medicinal. The tubers are dug out, cleaned and dried in shade before marketing. It is used as a tonic and also in the treatment of venereal diseases, piles, jaundice, asthma, etc. (Moss, 1977).

The roots are also used as a poultice for dermal complaints. The root-flour is also edible (Krishnamurthy, 1993).



Map 53 Distribution of *Curculigo orchiroides* Gaertn in Kerala

**References cited**

Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi. p. 191.  
 Moss, N.S. 1977. *Single Drug Remedies*. Vaidhyasarathy Press, Kottayam.

**54. CURCUMA AMADA ROXB.  
 (Zingiberaceae)**

**Nomenclature**

*Curcuma amada* Roxb., *Asiat. Res.* 11:341. 1810 & *Fl. Indica* I: 33. 1820; Baker in Hook.f., *Fl. Brit. India* 6: 213. 1890; Rama Rao, *Fl. Pl. Trav.* 401. 1914; Fisch. in Gamble, *Presid. Madras* 3: 1483. 1928; Mangaly *et Sabu*, *Rheedea* 3 (2): 148. 1993.

**Local name(s)**

Manga-inchi.

**Description**

Tufted **herbs** with underground, rhizomatous stem and aerial pseudostem, upto 35 cm high; **rhizomes** upto 48 x 4 cm, light yellowish inside with smell of green mango; **sessile tubers** upto 10 x 3 cm, ellipsoid or subcylindrical, branched. **Leaves** 4-6, subdistichous, lower ones smaller than the upper, upto 55 x 15 cm, oblong-lanceolate, closely pinnately veined, puberulous beneath, glabrous above, acuminate at apex; **petioles** 5-10 cm long. **Flowers** bright yellow or light violet, upto 5 cm long, in terminal or lateral, 10-20 cm long spikes; **peduncles** 15-20 cm long, 5-6 sheathed; **coma bracts** pinkish, 4-7 x 2-2.5 cm, fused at base, spreading; **fertile bracts** 15-18, almost 4 x 3.5 cm, orbicular, recurved, obtuse at apex, fused partially to form a pouch; **calyx** upto 1 cm long, deeply cleft on one side, 3-lobed at apex, minutely pubescent; **corolla** pale yellow, upto 3 cm long, tubular, funnel-shaped, minutely pubescent, lobed with the dorsal lobe hooded at apex and lateral lobes rounded and glabrous; **labellum** upto 1.5 cm long, 3-lobed, with the middle lobe emarginate at apex; **stamens** one perfect, upto 0.4 cm long, white, glabrous, with parallel anther thecae and basal spur upto 0.1 cm long, slightly convergent; **pistil** with upto 0.3 cm long trigonous ovary, filiform style and stigma closely appressed with anther lobes.

**Ecology**

Rare, along the banks of streams and rivulets in the valleys of semi-evergreen and adjoining moist deciduous forests. Flowering mostly in the rainy months of June, July and August and fruiting upto October.

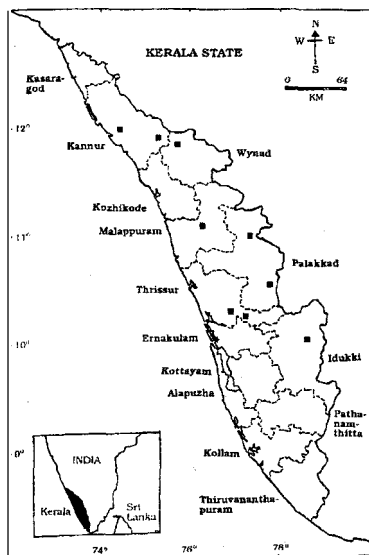
**Distribution**

Kerala

Cannanore, Wynad, Malappuram, Palghat, Trichur and Idukki districts; northern and central parts of the State, in the mid and highlands and also in cultivation (Map 54).

World

South India, Bengal.

Map 54 Distribution of *Curcuma amada* Roxb in Kerala**Products and uses**

Rhizomes of the plant are exploited for medicinal purposes and as a veg-

etable or condiment (Watt, 1872). Apart from its use as a cooling agent, stomachic and carminative, rhizomes are also used in the treatment of rheumatism and bruises, ie. in the form of a paste in combination with spirit and egg-white (Mangaly and Sabu, 1993). Rhizomes also yield an essential oil (Anonymous, 1950).

### Notes

A closely allied species is *Curcuma longa*, and *C. amada* differs from it by the characteristic mango smell, pale yellow colour inside the rhizomes and flowers which are light violet in colour.

### Production and marketing

Average yeild of the rhizomes of *C. amada* is about 6000 kg per hectare (Anonymous, 1950). There is no information available on the total quantity of the item extracted from the natural forests of Kerala and the cost of it fixed by the MFP Committee for the Kerala State SC & ST Federation (1998).

### References cited

- Anonymous, 1950. *The Wealth of India: Raw Materials*. vol. 2. CSIR, New Delhi. p. 401.
- Kerala State SC & ST Federation 1998. Different items of the LFPP handled during 1994-95 to 1996-97 and price fixed b the MFP committee per kilogram for 1997-98. Trivandrum (unpublished).
- Mangaly, J. and M. Sabu 1993. A taxonomic revision of the South Indian species of *Curcuma* Linn. (Zingiberaceae). *Rheedea* 3(2): 139-171.
- Watt, George 1872. *Dictionary of the Economic Products of India*. vol. 2. Govt. of India Press, Calcutta. p. 652.

## 55. CURCUMA AROMATICA SALISB. ( Zingiberaceae )

### Nomenclature

- Curcuma aromatica* Salisb., Parad. London t. 96. 1807; Wt., Ic. Pl. Ind. Orient. t. 2005. 1853; Baker in Hook.f., Fl. Brit. India 6: 210. 1890; Rama Rao, Fl. Pl. Trav. 400. 1914; Rao & Verma, Bull. bot. Surv. India 14: 122. 1972; Velayudh., et al., J. Eco. Tax. Bot. 14 (3): 579-582. 1990; Mangaly et Sabu, *Rheedea* 3 (2): 145. 1993; Krishnam., Min. For. Prod. India 158. 1993.
- Curcuma zedoaria sensu* Roxb., Asiat. Res. 11: 332. 1810. (*non* (Christm.) Rosc. 1807.); Fisch. in Gamble, Fl. Presid. Madras 3: 1483. 1928.

### Local name(s)

Kattu-manjal, Kattu-mannar, Vellachanna.

## Description

Rhizomatous **herbs** with palmately branched underground stem, 2.5-4.5 x 2-4 cm in size, yellow or light orange-yellow inside and aromatic with sessile subtubers; **pseudo-aerial stem** leafy, upto 90 cm high, erect. **Leaves** simple, distichous, petiolate, 5-7 in number, 35-65 x 9-13 cm, broadly lanceolate, oblong-elliptic or oblong-lanceolate, often variegated above, densely pubescent beneath, deltoid at base, caudate acuminate at apex; **petioles** upto 60 cm long, slender, greenish, fleshy. **Flowers** pink, fragrant, showy in lateral spikes, upto 25 cm long with pedicels 4-6 cm long, sheathed; **coma bracts** large, spreading, pink; **fertile bracts** pale greenish white, upto 6 cm long, sparsely pubescent; **corolla tube** pinkish white or rose-coloured, longer than the calyx lobes, funnel-shaped with unequal lobes; **dorsal lobes** broadly-ovate, arching the stamens, hooded; **lateral lobes** narrow, oblong; **labellum** deep yellow, orbicular or obovate, deflexed, subentire, obscurely 3-lobed with anthers parallel, ending in long sharp spurs at the base; **lateral staminode** oblong, as long as corolla lobes, obtuse at apex;  **pistil** with 3-loculed ovary, filiform style and 2-lobed stigma perforated in the centre.

## Ecology

Herbs with perennating, underground stem and aerial leafy pseudostem, sprouting by the onset of monsoon in May-June. The species occurs rarely along gravelly slopes, as undergrowth in moist deciduous forests and in valleys near streams.

## Distribution

### Kerala

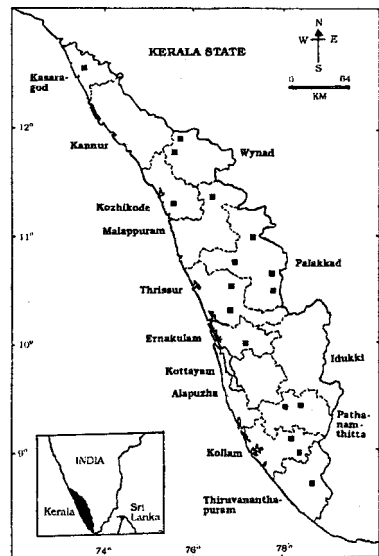
Kasaragod, Wynad, Calicut, Malappuram, Palghat, Trichur, Emakulam, Pathanamthitta, Quilon and Trivandrum districts; almost throughout the State, mainly in the mid to highlands and also in cultivation (Map 55).

### World

India, ascending to eastern Himalayas; probably native to Sri Lanka.

## Notes

There existed some confusion on the identity and synonymy of this species and that of *Curcuma zedoaria* (Christm.) Rosc. which is elucidated under the species *C. zedoaria*, that follows.



Map 55 Distribution of *Curcuma aromatica* Salisb in

### Products and uses

Rhizomes with camphoraceous smell is a flavouring agent and condiment (Krishnamurthy, 1993). Apart from its use as a substitute for turmeric (*Curcuma longa* L.), in medicine and perfume industry, the rhizomes of the plant are much in use. As a carminative, the tonic of rhizome is consumed and in combination with astringents, bitters and aromatics, it is used to heal bruises and sprains.

### Production and marketing

The medicinal rhizomes of the plant are collected on a large scale from the natural forests of Kerala. The Kerala State SC & ST Federation (1998) itself received about 70,361 kg of the rhizomes at a cost of Rs. 16.00 per kg from various tribal Societies in the State which was also marketed by the Federation with nominal profit.

### References cited

- Kerala State SC & ST Federation 1998, Different items of LFPP handled during 1994-95 to 1996-97, and price fixed by MFP Committee per kilogram for 1997-98. Trivandrum (unpublished).
- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi. p. 158.

## 56. CURCUMA NEILGHERRENSIS WT. (Zingiberaceae)

### Nomenclature

*Curcuma neilgherrensis* Wt., Ic. Pl. Ind. Orient. I: 2006. 1853; Baker in Hook. f., Fl. Brit. India 6: 210. 1890; Rama Rao, Fl. Pl. Trav. 401. 1914; Fisch. in Gamble, Fl. Presid. Madras 3: 1482. 1928; Mangaly *et* Sabu, Rheedeia 3(2): 160. 1993.

*Curcuma angustifolia* auct. non Roxb.; Dalz. *et* Gibs. Bombay Fl. 274. 1988.

### Local

Kattu-manjal, Koova, Manja-koova, Natturava.

### Description

**Herbs** with underground rhizome and aerial pseudostem, upto 2 m high; **rhizomes** about 3 x 2 cm, pale-yellow inside, aromatic. **Leaves** simple, distichous, sheathed, petiolate, 6-25 x 2.5-7.5 cm, oblong-lanceolate, glabrous or pubescent when young, narrowed at base, subacute or acute at apex; **petioles** 4-12 cm long, grooved above, glabrous; **sheaths** green or with purplish streaks, glabrous. **Flowers** yellow in terminal, solitary spikes, upto 15 x 5 cm in size; **peduncles** upto 10 cm long, cylindrical, covered with

sheath towards base; **flowering bracts** yellowish green, upto 2 cm long, oblong-lanceolate, acute; **plume bracts** purple, upto 4 cm long, ovate, acute; **calyx** upto 1 cm long, 3-toothed, split on one side; **corolla** tubular, upto 2 cm long, 3-lobed; **staminodes** and lip bright yellow, both upto 2.5 cm long, the latter emarginate; **stamens** one perfect, with filaments upto 1.5 cm long and anthers upto 0.4 cm in length; **pistil** with villous ovary, filiform style and bifid stigma. **Capsules** upto 1.5 cm long, subglobose, glabrous; **seeds** 3.5-5 mm, obovate.

**Ecology**

Rhizomatous herbs with aerial pseudostem, bearing prominent yellow terminal inflorescence during the rainy season, viz. May-July. The species commonly occurs in shaded areas of moist deciduous forests, along river banks, waste places, etc. The species is also rather common in the homesteads.

**Distribution**

Kerala

Cannanore, Wynad, Malappuram, Palghat and Ernakulam districts; mainly in the northern and central parts of the State in the mid and highlands and also sometimes in cultivation (Map 56).

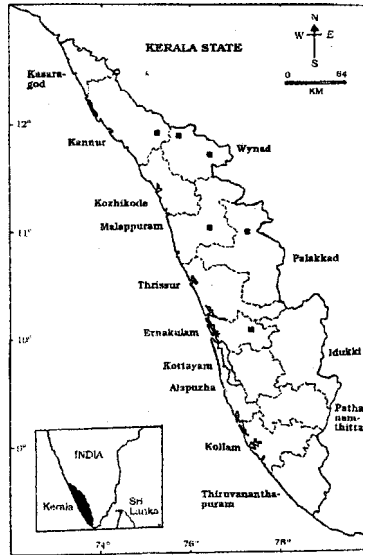
World

Peninsular India.

**Notes**

*Curcuma angustifolia* Roxb. (Asiat. Res. 11:338.t. 3. 1810) was sometimes confused as this species (as was considered by Dalzell and Gibson, 1861). In fact, *C. angustifolia* Roxb. is a species confined to North-East India (Assam, Meghalaya and Nagaland) and does not occur in Peninsular India,

whereas *C. neilgherrensis* Wt. is endemic to Peninsular India. Probably, it may be because of this reason that *C. angustifolia* is said to yield Travancore starch, even though the species is not available in Travancore (ie. southern part of Kerala).



Map 56. Distribution of *Curcuma neilgherrensis* Wt. in Kerala

The species is closely related to *C. oligantha* Trim., but differs from it by the presence of a distinct coma and larger bracteoles (Mangaly and Sabu, 1993). This species is not dealt with in Krishnamurthy's (1993) account of the non-timber forest products of India.



## Products and uses

The rhizomes of the plant are the source of an edible starch called Travancore starch or the East Indian arrow root. The underground stem is extracted, cleaned and pulped to separate fibrous materials and then repeatedly washed and filtered. The starch, so separated, is sun-dried and stored or marketed. It is used as a substitute for arrow root powder in various preparations.

## Production and marketing

The medicinal rhizomes of the plant are extracted, dried and marketed as a source of starch. The Kerala State SC & ST Federation (1998) received from its NWFP collection centres in the State, a total of 3109 kg of the item during 1994-95 to 1996-97, which was also marketed by the them. During that period, the procurement rate of the product was Rs. 9.50 per kg and selling price was fixed as Rs. 10.00 per kilogram by the MFP Committee.

## References cited

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- Kerala State SC & ST Federation 1998. Different items of LFPP handled during 1994-95 to 1996-97 and price fixed by MFP Committee per kilogram for 1997-98. Trivandmm (unpublished).
- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi.
- Mangaly, J. and M. Sabu 1993. A taxonomic revision of the South Indian species of *Curcuma* Linn. (Zingiberaceae) *Rheedea* 3(2): 139-171.

## 57. CURCUMA ZEDOARIA (CHRISTM.) ROSC. ( Zingiberaceae )

### Nomenclature

*Curcuma zedoaria* (Christm.) Rosc., Trans. Linn. Soc. London 8: 354. 1807; Baker in Hook.f., Fl. Brit. India 6: 210. 1890; Rama Rao, Fl. Pl. Trav. 400. 1914; Fisch. in Gamble, Fl. Presid. Madras 3: 1482. 1928 (as '*zedoaria*'); Burt, Gardn. Bull. Singapore 30: 59. 1977; Nicol. *et al.*, Intrap. Hort. Malab. 317. 1988; Kumar, J. Econ. Tax. Bot. 15: 723. 1991; Mangaly *et Sabu*, *Rheedea* 3 (2): 168. 1993.

*Amomum zedoaria* Christm. in Christm. *et Panzer*, Linn. Pflanzensyst. 5: 12. 1779. *Curcuma zerumbet* Roxb., Asiat. Res. 11: 332. 1810 & Pl. Corom. 3: t. 201. 1819 (*nom. illeg.*).

### Local name(s)

Adavi-kachola, Kachuri-kizhangu, Kasturi-manjal, Kattu-kuva,

## Description

**Herbs**, rhizomatous with broadly ovoid, camphor-smelling underground stem, upto 7 x 8 cm in size, deep yellow inside with sessile, palmately branched tubers and branched, fleshy roots; **sessile tubers** pearl-white inside, upto 4.5 x 1.5 cm in size, fusiform, fleshy; **pseudo-aerial stem** upto 90 cm high, erect. **Leaves** 4-6, simple, distichous petiolate, 30-55 x 12-18 cm, oblong or oblong-lanceolate with purple coloured patch on the upper side along the midrib throughout the length, glabrous, acuminate at apex; **petioles** 30-45 cm long. **Flowers** yellow in 15-20 cm long, stout, lateral spikes, covered with obtuse sheaths; **coma bracts** dark pink, 4-6 in number, upto 8 x 3.5 cm in size, fused at base; **fertile bracts** 20-25 in number, green with pink margins, 4.5 x 3.5 cm in size, ovate with recurved tip; **bracteoles** white, upto 1.5 x 1 cm in size, inner smaller; **calyx** greenish-white, upto 1 cm long, 3-lobed at apex, deeply split on one side, pubescent; **corolla** white or pinkish, upto 3 cm long, funnel-shaped, unequally lobed with the dorsal lobe upto 1.5 cm long, broadly triangular and hooded and lateral lobes narrower; **labellum** pale yellow with a deep yellow band, shortly 3-lobed, the middle lobe emarginate and anthers upto 0.5 cm long, spurred; **lateral staminodes** pale yellow, upto 1.2 cm long, oblong; **pistil** with ovary upto 0.3 cm long, trilocular and many ovuled on axile placenta, filiform style and 2-lipped, ciliate stigma. **Capsules** ovoid, trigonous, smooth; **seeds** ellipsoid with white, lacerate aril (Fig. 21).



Fig. 21. *Curcuma zedoaria* (Christm.) Rosc

## Ecology

Aromatic herbs, common as an undergrowth in evergreen, semi-evergreen and in moist deciduous forests and in valleys of hills and near stream banks. The plant is also sometimes cultivated in Kerala. Pseudo-aerial stem, produced by the onset of monsoon in April-May bears inflorescence by July. Also grown in gardens. The perennating underground stem gives rise to new plants by the onset of monsoon in May-June.

## Distribution

Kerala

Cannanore, Wynad, Calicut, Malappuram, Palghat, Trichur, Ernakulam,

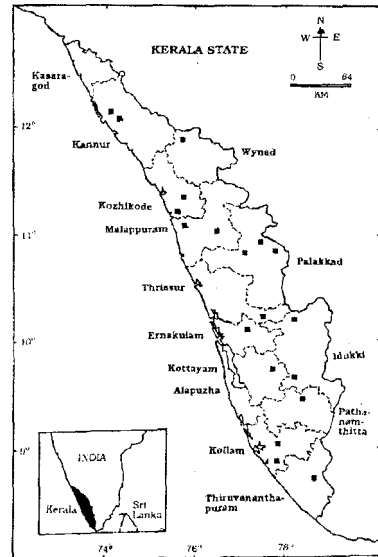
Kottayam, Pathanamthitta, Quilon and Trivandrum districts; almost throughout the State (Map 57).

#### World

India, Sri Lanka, South-East Asia.

#### Notes

Rao and Verma (1972), considering *Curcuma zedoaria* Rosc. (1828) and *Curcuma zedoaria* Roxb. (1810) as one and the same species, commented that Roscoe's combination being a later homonym has to be rejected, and Roxburgh's combination published in 1810 has to be accepted as the valid name of the species. In fact, Roscoe's and Roxburgh's binomials refer to two separate species, i.e. *Curcuma zedoaria* of Roxburgh is taxonomically *Curcuma aromatica* Salisb. and therefore, Roscoe's combination *C. zedoaria* is valid for the species. This species of *Curcuma*, much extracted from the forests of Kerala has not been included in the work of Krishnamurthy (1993).



Map 57. Distribution of *Curcuma zedoaria* (Christm.) Rosc. in Kerala.

#### Products and uses

As a source of starch with cooling and demulient properties and for medicinal use, the rhizome of the plant is much extracted. The rhizome also possesses stimulant properties and is therefore used in the manufacture of liquors, essences and butters. It is also used in the manufacture of perfumes and cosmetics. Along with pepper and honey, the rhizome is also effective in curing cold. Steam distillation of rhizomes yields a yellow oil and dried and powdered rhizomes mixed with Sappan wood (*Caesalpinia sappan* L.) decoction produces the red powder Abir. Rhizome juice is also administered against leucorrhoeal and gonorrhoeal discharges and for blood purification.

#### Production and marketing

Zedary roots (rhizomes) extracted from *C. zedoaria* plants are both domestically consumed and also exported. While there is no data available on the quantity of domestic consumption of the product, Shiva, *et al.* (1996) had recorded that about 77 tonnes of the item was exported from India during 1980-81, worth Rs. 0.38 million and during 1990-91, this increased to 39.5 tonnes, worth Rs. 0.67 million. From Kerala State, the SC & ST Federation (1998) received only about 30 kg of the item during 1994-95 to 1996-97, at

a cost of Rs. 11.40 per kg which was sold for Rs. 12.00 per kilogram. However, there is in record that during 1930s, large quantity of the dried rhizomes of *C.zedoaria* were exported from Kerala State (Anonymous, 1950) through the Alapuzha port in Alapuzha District.

### References cited

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- Kerala State SC & ST Federation 1998. Different items of LFPP handled during 1994-95 to 1996-97 and price, fixed by MFP Committee per kilogram for 1997-98. Trivandrum (unpublished).
- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi. p. 158.
- Rao, A.S. and D.M. Verma 1972. Materials towards a monocot flora of Assam-11 (Zingiberaceae & Marantaceae). *Bull. bot. Surv. India* 14: 122.
- Shiva, M.P., Saritha Aswal, Abha Sharma, Pravin Mathur and Rakesh Chandra 1996. *Trends of Export and Import of Minor Forest Products in India*. Centre for Minor Forest Products, Dehra Dun. 38 p.

## 58. CYCLEA PELTATA (POIR.) HOOK.F. ET THOMS. (Menispermaceae)

### Nomenclature

- Cyclea peltata** (Poir.) Hook.f. et Thoms., Fl. Indica 201. 1855 & in Hook.f., Fl. Brit. India 1: 104. 1872 (excl. syn. *C. barbata* Miers); Rama Rao, Fl. Pl. Trav. 13. 1914; Dunn in Gamble, Fl. Presid. Madras 1: 31. 1915; Sant. et Janardh., Bull. bot. Surv. India 10: 368. 1968; Nicol. et al., Intrap. Hort. Malab. 179. 1988; Prama. in Sharma, et al. (ed.) Fl. India 1: 325-326. 1993.
- Menispermum peltatum* Poir. in Lamk., Encyl. Meth. Bot. 4: 96. 1767.
- Cyclea burmanii* Wt. et Arn., Prodr. 14. 1834; Hook.f. et Thoms., Fl. Indica 201. 1855 & in Hook.f., Fl. Brit. India 1: 104. 1872; Rama Rao, Fl. Pl. Trav. 13. 1914.
- Cocculus peltatus* (Poir.) DC., Syst. 1: 516. 1817 & Prodr. 1: 96. 1824.
- Cyclea arnottii* Miers in Contrib. Bot. 3: 240. 1871; Dunn in Gamble, Fl. Presid. Madras 1: 31. 1915.

### Local name(s)

Padathali.

### Description

Shrubby **climbers**, 1-2.5 m high; **branchlets** hairy-pubescent, pale green. **Leaves** simple, alternate, 2.5-6 x 2-5.5 cm, peltate, undulate along the margins, smooth and shiny above, pubescent and pale green beneath,

truncate or shallowly subcordate at base, acute at apex; **petioles** 2-6.5 cm long, slender, pubescent. **Flowers** greenish white, in small clusters forming axillary panicles with pubescent branches; **male flowers** with calyx campanulate and 4-segmented, corolla 4-fid with inflexed lobes and short staminal column; **female flowers** solitary or in twins forming racemes with oblong, hairy sepals, orbicular, short petals, and subulate carpel gibbous at base with short 3-5 fid style; **staminodes** 6. **Drupes** white, 0.3-0.5 cm across, subglobose, compressed, hairy or pilose with subbasal style scars; **seeds** horse-shoe shaped with transversely ridged endocarp.

**Ecology**

A hedge climber with slender stem and light green leaves, rather common on bushes and such low supports in moist and dry deciduous forest areas, especially along roadsides, forest boundaries, waste places and so on. The plant flowers during October to March and fruits mature during March to May.

**Distribution**

Kerala

Kasaragod, Cannanore, Wynad, Calicut, Malappuram, Palghat, Trichur, Idukki, Pathanamthitta and Trivandrum districts; almost throughout the State, from the mid to the highlands (Map 58).

World

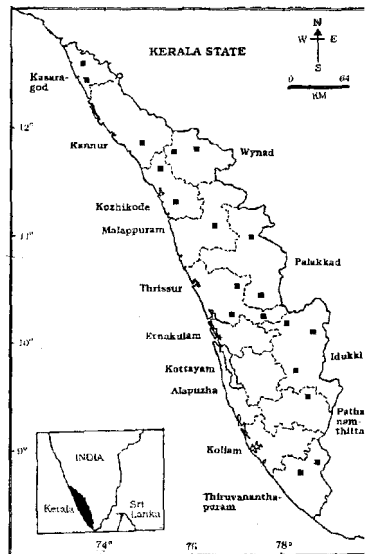
Peninsular and central India, Sri Lanka, Java.

**Notes**

This species is an addition to the non-timber forests produce plants of India, dealt with by Krishnamurthy (1993).

**Products and uses**

Roots which contain the alkaloid Cyclein are medicinal, mainly as an anti-febrile. It is also used against a variety of abdominal ailments like liver disorders, jaundice, stomach ache, dysentery, and so on. Nambiar, *et al.* (1985) has reported that the roots are also used in the treatment of asthma and leprosy. The leafjuice of the plant is also used to cure wounds and in the preparation of beverages.



Map 58 Distribution of *Cyclea peltata* (Poir.) Hook.f etThoms inKerala

**Production and marketing**

The tuberous roots of the plant is the extracted and marketed item of

wood forest produce. During 1996-97, the Kerala State SC & ST Federation (1988) received about 1168 kg of the material at the rate of Rs. 47.50 per kg which was sold at a cost of Rs. 50.00 per kilogram.

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- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi.
- Nambiar, V.P.K., N. Sasidharan, C. Renuka and M. Balagopalan. 1985. Studies on the Medicinal Plants of Kerala Forests. *KFRI Research Report No. 45*. KFRI, Peechi. p. 4.

## 59. CYMBOPOGON FLEXUOSUS (NEES EX STEUD.) WATS. ( Poaceae )

### Nomenclature

*Cymbopogon flexuosus* (Nees *ex* Steud.) Wats. in Atkins., Gaz. North-West. Prov. India 392. 1882; Fisch. in Gamble, Fl. Presid. Madras 3: 1756. 1934; Bor, Grass. Bur. Cey. Ind. Pak. 127. 1960; Soenarko, Reinwardtia 9: 353. 1977; Sreek. *et* Nair, Fl. Kerala Grass. 69-70. 1991; Krishnam., Min. For. Prod. India 122-126. 1993.

*Andropogon flexuosus* Nees *ex* Steud., Syn. Pl. Glum. 1: 388. 1854.

*Andropogon nardus* L. ssp. *flexuosus* (Nees *ex* Steud.) Hack. in DC., Monogr. Phan. 6: 603. 1889; Hook.f. in Hook.f., Fl. Brit. India 7: 207. 1896; Rama Rao, Fl. Pl. Trav. 441. 1914.

### Local name(s)

Inchi-pullu, Kodi-pullu, Theruvai, Vattu-pullu.

### Description

Perennial, stout **herbs**, 0.6-2.5 m high. **Leaves** linear, 15-55 x 0.5-2 cm, oblong-lanceolate, aromatic, pectinate-serrate along the margins, acuminate at apex, sheathed at base; **ligules** ovate, membraneous. **Flowers** in long peduncled, compound panicles, 20-75 cm long, with racemose branches sub-



Fig. 22. *Cymbopogon flexuosus* (Nees *ex* Steud.) Wats.

tended by spathes; **spikelets** sessile or shortly pedicelled, 0.3-0.5 cm long, elliptic-lanceolate; **lower glume** upto 0.4 x 0.1 cm, elliptic-lanceolate, subcoriaceous, faintly 5-7 nerved with keels winged towards apex; **upper glume** ovate-lanceolate, ciliate along the margins; **lower floret** empty; **upper floret** bisexual; **first lemma** purplish, upto 0.3 x 0.1 cm, delicate, hyaline; **second lemma** deeply nouched, upto 0.4 x 0.2 cm, about 1 cm long awned; **lodicules** 2, upto 0.5 x 0.2 cm, oblanceolate, obtuse at apex; **stamens** 3 with 0.1-0.2 cm long anthers; **pistil** with oblong ovary, upto 0.1 cm long and style and stigma upto 0.1 cm; **pedicelled spikelets** with lower floret male with 3 stamens and upper floret wanting. **Caryopsis** upto 0.2 cm long, elliptic-lanceolate (Fig. 22).

**Ecology**

Aromatic grasses, wild or cultivated, mostly in lateritic and dry soil with sufficient drainage. The species is seen as a secondary species in semi-evergreen and deciduous forests of Kerala, especially along hill sides, at altitudes ranging from 150m to 1100m. June to December is the flowering and fruiting period of the grass.

**Distribution**

Kerala

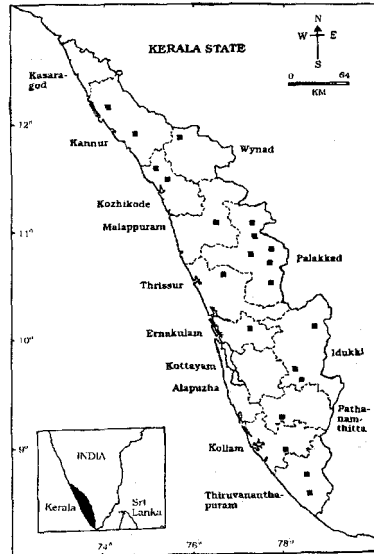
Cannanore, Wynad, Calicut, Malappuram, Palghat, Trichur, Ernakulam, Idukki, Quilon and Trivandrum districts; almost throughout the State from the mid to the highlands and also in cultivation (Map 59).

World

India, South-East Asia.

**Notes**

It is the typical variety, ie. *var. flexuosus* that is represented in Kerala. The species can be easily identified in the field by the reddish colour of the culms and inflorescence, which is not found with the closely allied species *Cymbopogon travancorensis* Bor, with which it is some times confused.



Map 59. Distribution of *Cymbopogon flexuosus* (Nees ex Steud.) Wars. in Kerala.

**Products and uses**

As the source of East Indian or Malabar Lemon grass oil, the lemon or ginger grass is highly exploited from its natural habitats and also cultivated to meet

the excessive demand. Krishnamurthy (1993) had given details on the cultivation, harvesting and distillation procedures in practice. It is the leaves which are distilled to extract the oil which contain 65-85% of citral, in addition to other ingredients like methyl heptanone, decyclicaldehyde, geraniol, linalool, limonene and dipentene. The oil is extensively used in perfume, soap and cosmetic industries and as a mosquito repellent and disinfectant (Anonymous, 1950). Fresh leaves are used as fodder and the corky inflorescence axis is made into toys and coloured neck chains. Medicinally, lemon grass oil is a carminative and decoction of the leaves of this grass is used in the treatment of fever, as an apitiser and stimulant.

### **Production and marketing**

Lemongrass oil distilled from the aerial parts of the plant is consumed within the country and also exported. Being a product mostly coming from non-forest areas, the Kerala State SC & ST Federation is not collecting it for sale, as understood from their records (1998), eventhough the Federation had enlisted it as a non-wood forest produce. Also, there is **no** record on the total production of the aromatic oil in the country, eventhough Shiva, *et al.* (1996) had reported that about 313.4 tonnes of it was exported from India during 1980-81 and this was reduced to about 53 tonnes during 1990-91, worth Rs. 10.2 million. This reduction in the production and marketing of this aromatic oil is probably due to drastic decline in the cultivation of Lemongrass, both in forest and non-forest areas of the country. Legal restrictions imposed by forest laws, introduction of cash crops like rubber in non-forest areas of the State and, the socio-economic reasons linked with this labour and fuel intensive process of distilling the oil might have their impact on the total production of the item. This is evident from the fact that, during 1945-46, for example, Lemongrass oil worth Rs. 70 million was exported from India to countries like United States, United Kingdom and Germany, whereas its present production is far less.

### **References cited**

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- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi. pp. 122-126.
- Shiva, M.P., Saritha Aswal, Abha Sharma, Pravin Mathur and Rakesh Chandra 1996. *Trends of Export and Import of Minor Forest Products in India*. Centre for Minor Forest Products, Dehra dun. 38 p.



**60. DECALEPIS HAMILTONII Wt. ET ARN.**  
(Periplocaceae)

### Nomenclature

*Decalepis hamiltonii* Wt. et Arn. in Wt., Contrib. Ind. Bot. 64. 1837; Wt., Ic. Pl. Ind. Orient. t. 1285. 1848 & III. Ind. Bot. 1: 182. f. 6. 1850; Hook. f. in Hook. f., Fl. Brit. India 4: 11. 1883; Rama Rao, Fl. Pl. Trav. 259. 1914; Gamble, Fl. Presid. Madras 2: 828. 1923; Krishnam., Min. For. Prod. India 158. 1993.

### Local name(s)

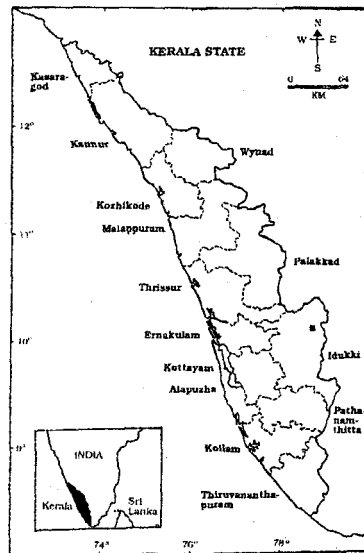
Kattu-nannari, Mahali-kizhangu.

### Description

Shrubaceous **climbers**, upto 12 m high, with milky latex and tuberous roots; **branchlets** terete with swollen, winged nodes. **Leaves** simple, opposite, 2.5-7 x 1.5-5 cm, ovate, subcoriaceous, entire or undulate along the margins, often longitudinally folded, attenuate or truncate at base, subacute or subobtuse at apex; **petioles** 0.5-1 cm long, slender. **Flowers** creamy-white or yellowish in trichotomous cymes; **bracts** and **bracteoles** rarely upto 0.2 cm long, lanceolate; **pedicels** upto 1 cm long; **calyx** deeply 5-lobed with lobes upto 0.2 cm long, oblong, brown tinged, chartaceous, acute at apex; **corolla** upto 0.6 cm across, campanulate with 5 valvate, spreading, villous lobes, upto 0.4 cm long and acute to recurved at apex; **stamens** 5, with filaments free above and united below and horizontal pollinia, upto 0.5 cm long; **corona** double, staminal; **pistil** with ovary upto 0.1 cm long, subglobose, style 0.5-0.7 cm long, slender and stigma obtuse or flat. **Follicles** 4-5 x 2.5-3 cm, oblong or lanceolate, cylindrical; **seeds** upto 0.5 x 0.3 cm, ovate, angled, chartaceous, tipped with long, white, silky coma.

### Ecology

A very rare species in the forests of Kerala, habituated to dry, rocky areas, often shedding leaves by January-February. Flowers are produced during May to July and fruits which mature by December-January are persistent almost throughout the year.



Map 60 Distribution *Decalepis hamiltonii* Wt. et Arn in Kerala

### Distribution

Kerala

Idukki District and southern parts of Kerala (Map 60).

World

Peninsular India.

### Notes

An endemic species of Peninsular India, endangered due to excessive exploitation. No specimen could be examined for the species from Kerala and the data given here is based on literature

### Products and uses

It is mainly the roots of the plant which are extracted for medicinal use. The fleshy, cylindrical (upto 6 cm in diameter) roots are strongly aromatic and sweetish with the sarasapparilataste, creating tingling sensation on the tongue. It is a spice, condiment (Krishnamurthy, 1993), apitiser and blood purifier. The roots are also pickled with lemon. The volatile ingredient sponisible for the aroma is 4-0-methyl-resorcylaldehyde which is present in the roots upto a concentration of 0.8% of the air-dried weight (Anonymous, 1952).

### References cited

- Anonymous, 1952. *The Wealth of India: Raw Materials.* vol. 3. CSIR, New Delhi. p.24.
- Krishnamurthy, T. 1993. *Minor Forest Products of India.* Oxford & IBH, New Delhi. p. 158.

## 61. DENDROCALAMUS STRICTUS (ROXB.) NEES (Bambusaceae)

### Nomenclature

*Dendrocalamus strictus* (Roxb.) Nees, Linnaea 9: 476. 1834; Gamble, Ann. Roy. bot. Gardn. Calcutta 7: 78. 1896 & in Hook.f., Fl. Brit. India 7: 404. 1897; Bourd., For. Trees Trav. 401. 1908; Rama Rao, Fl. Pl. Trav. 447. 1914; Fisch. in Gamble, Fl. Presid. Madras 3: 1858. 1934; Benn. et Gaur, Thirty Seven Bamb. 61. 1990; Tew., Monogr. Bamb. 77. 1992; Krishnam., Min. For. Prod. India 191-192, 476, 489. 1993; Dransfl. et Widjaja, Prosea 7 (Bamboos): 93-97, fig. 1995. *Bambusa stricta* Roxb., Pl. Corom. 1: 58. t. 80. 1798.

### Local name(s)

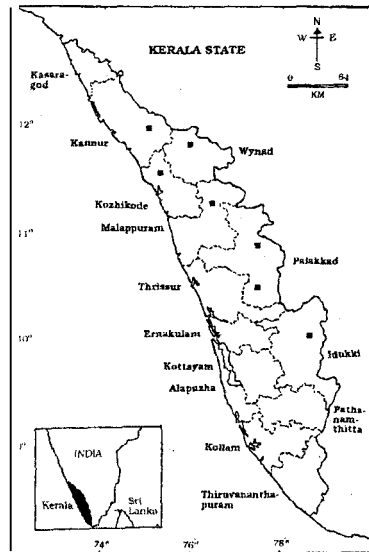
Kal-mugil,

**Description**

Tufted, deciduous bamboo, 10-15m high; **culms** upto 7 cm in diameter. bluish green when young, dull green or yellowish when mature with swollen nodes having aerial roots and branches towards base and internodes upto 40 cm long; **culm-sheath** lower shorter upto 25 cm long with brown, stiff hairs on the back or rarely glabrous striate hairy along the margins; **ligules** upto 0.3 cm long, toothed, auricled. **Leaves** upto 22 x 3 cm, linear-lanceolate, rough and hairy above, soft hairy beneath, rounded and shortly petioled at base, sharply acuminate with a twisted point at the apex; **petioles** very short. **Flowers (spikelets)** upto 1.2 x 0.5 cm, spinous and usually hairy, in large panicles of dense globular heads; **glumes** 2 or more empty with flowering glumes ovate ending on a sharp spine surrounded by ciliate tuft of hairs; **palea** ovate or obovate, lower ones two keeled, emarginate; **stamens** 5 with long exerted filaments and yellow, shortly apiculate anthers; **pistil** with turbinate ovary, hairy above, and terminating in a long spine with purple, feathery stigma. **Caryopsis** brown, upto 0.6 cm long, ovoid to subglobose, hairy above, peaked with the styler base.

**Ecology**

A common densely tufted bamboo gregarious in the moist and dry deciduous forest tracts and also in non-forest areas of the State, shedding leaves by February-March with new foliage appearing by April. The flowering is both gregarious and sporadic as reported (Tewari, 1992) from different parts of India which has been documented by Blatter (1930) during the period 1865-1940. Rama Rao (1914) has reported the flowering period of this bamboo in Kerala as November to April and fruiting month as June. The flowered culms perish once the seeds ripen and disperse.



Map 61. Distribution of *Dendrocalamus strictus* (Roxb.) Nees in Kerala.

**Distribution**

Kerala

Cannanore, Wynad, Calicut, Malappuram, Palghat and Idukki districts; mainly in the mid and hilly uplands of the State (Map 61).

**World**

Native of India, Nepal, Bangladesh, Myanmar and Thailand, grown elsewhere in South-East Asia and America.

**Products and uses**

This is one of the most useful species of bamboo in India. The culms are used in large quantities by the paper mills for pulping. It is also used in construction, as masts of boats and also for making mats, baskets and sports goods like javaline spears, skysticks, etc. Agricultural implements and furniture of various types are also made of the culms of this bamboo.

This is also an edible species of bamboo and the young and tender rhizomes of it are pickled (Krishnamurthy, 1993) and eaten as vegetable and the ground shoots are also consumed (Dransfield and Widjaja, 1995). The seeds are also considered as a food grain, especially during famine periods. The silicacious matter at the nodal joints of this bamboo is medicinal as a cooling, tonic and astringent (Rama Rao, 1914).

**Production and marketing**

Yield data of the bamboo species is mainly available from plantations. One hectare plantation with about 4000 to 5000 culms, ie. 250 to 300 clumps, can be harvested for 750 to 1000 culms on a three year extraction cycle (Seethalakshmi and Muktheshkumar, 1998). Also Reddy and others (1992) had estimated that annual net income is about Rs. 35000 from one hectare plantation of the species for a year starting from sixth year of planting. Inter-cropping the plantation with legume crops or Casuarina is also in practice.

**Regeneration**

The bamboo which can withstand drought, regenerates well in almost all types of soil with proper drainage and sandy-loam is the best among them. After flowering at an interval of 25-45 years (Seethalakshmi and Muktheshkumar, 1998), the seeds dispersed germinate after the first few monsoon showers.

Artificial propagation of the bamboo is commonly done by nursery raised seedlings. When profuse seeding takes place, the ground below the clumps are cleared and the fallen seeds are collected and cleaned by winnowing. One kilogram of seeds contain about 29000 to 32000 numbers (Luna, 1996) and germination rate varies from 25-61 percent. The seeds can be sown on standard nursery beds, sterilized and mixed with farmyard manure. Seeds, pre-treated with cold water for 24-48 hours, are sown on the beds in drills, 24 cm apart. Germination starts by 7 days (Luna, 1996) and will be completed within 48 days. Even though one year old seedlings can be trans-

planted in pits of 30 cm x 30 cm x 30 cm at an espacement of 6m x 6m, 2-year old ones give, better survival percentage. Artificial propagation of the bamboo by offset planting, clum cuttings (Seethalakshmi and Surendran, 1985) and by tissue-culture raised plants (Zamora, 1994) are also in practice.

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- Zamora, A. B. 1994. Review on micropropagation research on bamboos. In: *Constraints to Production of Bamboos and Rattan*. INBAR Technical Report No. 5. New Delhi. pp. 45-64.

## 62. DESMODIUM GANGETICUM (L.) DC. ( Papilionaceae )

### Nomenclature

- Desmodium gangeticum* (L.) DC., Prodr. 2: 327. 1825; Wt. et Arn., Prodr. 225. 1834; Baker in Hook.f., Fl. Brit. India 2: 168. 1876; Rama Rao, Fl. Pl. Trav. 115. 1914; Gamble, Fl. Presid. Madras 1:345. 1918; Meeuwen, Reinwardtia 6: 249. 1962; Schubert, J. Arn. Arbor. 44: 294. 1963; Ohashi, Ginkgoana 1: 184. 1973.
- Hedysarum gangeticum* L., Sp. Pl. 746. 1753.
- Desmodium collinum* Roxb. (Hort. Beng. 57. 1814, *nom. nud.*) Fl. Indica ed. 2, 3: 349. 1832; Wt., Ic. Pl. Ind. Orient. t. 272. 1840.

**Local name(s)**

Orila.

**Description**

Erect **undershrubs**, upto 2 m high with irregularly angular, glabrescent stems; **branchlets** angular, appressed white hairy. **Leaves** alternate, 1-foliolate, 6-12 x 3.5-6 cm, ovate-oblong, glabrous above, appressed hairy beneath, rounded, truncate or subcordate at base, acute or acuminate at apex; **petioles** 1-2 cm long, slender. **Flowers** white or tinged with lilac in axillary or terminal racemes of few-flowered fascicles, upto 30 cm long, with angular rachis; **pedicels** upto 0.5 cm long, filiform, pubescent; **calyx** upto 0.2 cm long, campanulate, hairy, 4-lobed, triangular toothed; **corolla** upto 0.5 cm long, with the standard petal about 0.4 cm broad, cuneate at base, wing petals upto 0.3 x 0.2 cm, obtuse at the apex and keel petals connate, almost 0.4 x 0.2 cm, obtuse or rounded at the apex, gradually tapering to the base; **stamens** 9+1, 0.3-0.4 cm long with staminal sheath upto 0.3 cm long and 2-loculed anthers; **pistil** 0.4-0.5 cm long with ovary sessile, upto 0.3 cm long, style almost 0.15 cm in length, curved upwards and minute and terminal capitate stigma. **Pods** 1-2 cm long, subfalcate, 6-8 jointed, sparsely minute hairy, indehiscent; **seeds** upto 0.2 x 0.3 cm, depressed-obovate or transversely elliptic.

**Ecology**

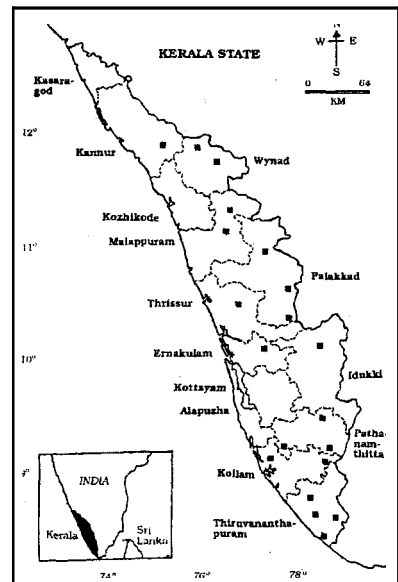
A very variable species with regard to leaves, hairiness of vegetative parts and growth habit, depending on the habitat. Common as undergrowth in disturbed forest areas of the deciduous type, forest openings, forest fringes and such degraded habitats. Flowers and fruits are produced during November to January.

**Distribution****Kerala**

Cannanore, Wynad, Malappuram, Palghat, Trichur, Ernakulam, Idukki, Pathanamthitta, Quilon and Trivandrum districts; almost throughout the State (Map 62).

**World**

Asia (India, Sri Lanka, Himalayas, Myanmar, Thailand, Indo-China, Malesia, China, Taiwan and Ryukyu), Tropical Africa, Australia.



Map 62. Distribution of *Desmodium gungeticum* (L.) DC in Kerala

## Notes

The species is closely allied to both *Desmodium pyronii* DC. and *Desmodium flexuosum* Wall. *ex* Benth. and their differences are only in vegetative characters, whereas floral characters are almost the same, except for the length of pedicels and fruits, which again is a quantitative variation.

## Products and uses

Roots of the plant constitute one of the ingredients in Dasamoola - a particular combination of 10 roots of different species - used in the Ayurvedic system of medicine (Watt, 1890; Anonymous, 1950) and hence extracted on a large scale from the forests of Kerala.

## Production and marketing

Large quantity of the roots of the plant is extracted from the natural forests of Kerala. The Kerala State SC & ST Federation (1998) itself handled about 38,726 kg of the roots during 1994-95 to 1996-97 at a cost of about Rs. 12.00 per one kilogram. A lot of the drug product is also reaching the crude drug market directly from the forest areas of the State. Shiva. *et al.* (1996) has not included the product as an exported item.

## References cited

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- Kerala State SC & ST Federation 1998. Different items of LFPP handled during 1994-95 to 1996-97 and price fixed by MFP Committee per kilogram for 1997-98. Trivandrum (unpublished).
- Shiva, M.P., S. Aswal, A. Sharma, P. Mathur and R. Chandra 1996. *Trends of Export and Import of the Minor Forest Products in India*. Centre for Minor Forest Products, Dehra Dun. 38 p.
- Watt, George 1890 *A Dictionary of the Economic Products of India*. vol. 3. Govt. of India Press, Calcutta. p. 82.

## 63. DIOSCOREA PENTAPHYLLA L. (Dioscoreaceae)

### Nomenclature

*Dioscorea pentaphylla* L., Sp. Pl. 1032. 1753; Wt., Ic. Pl. Ind. Orient. t. 814. 1844; Hook. f. in Hook. f., Fl. Brit. India 6:289. 1892; Rama Rao, Fl. Pl. Trav. 408. 1914; Fisch. in Gamble, Fl. Presid. Madras 3:1511. 1928; Sant., 3. Bombay nat. Hist. Soc. 49:634. 1950; Rao *et* Verma, Bull. bot. Surv. India 15:193. 1973; Nicol., *et al.*, Intrap. Hort. Malab. 292. 1988; Krishnam., Min. For. Prod. India 193. 1993.

*Dioscorea triphylla* L., Sp. Pl. 1032. 1753.

*Dioscorea pentaphylla* L. var. *communis* Prain et Burk., J. Proc. Asiat. Soc. Bengal 10:23. 1923; Ann. Roy. bot. Gard. Calcutta 14(1): 168. 1936.

*Dioscorea pentaphylla* L. var. *reedii* Prain et Burk., J. Proc. Asiat. Soc. Bengal 10: 23. 1923 (as '*rheedii*') & Ann. Roy. bot. Gard. Calcutta 14(1): 167. 1936.

### Local name(s)

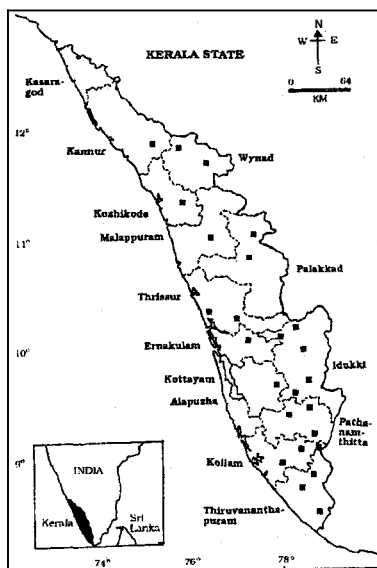
Chakari-nuran, Chaval, Korna-pidan, Nuran, Nuran-kizhangu.

### Description

Tuberous **herbs** with aerial climbing, terete, prickled stem, upto 10m high; **axillary bulbils** profuse, globose or ellipsoid, brownish outside, yellowish or purplish inside; **branchlets** twining to left, sometimes prickled, pubescent or glabrous. **Leaves** alternate, 3-5-foliolate, 5-10 cm long; **petioles** usually about three-fourth as long as the middle leaflet; **petiolules** 0.3-0.5cm long; **middle leaflet** 3-7 x 1.5-2.5cm, elliptic, oblanceolate or obovate, pubescent, acute or acuminate at apex; **lateral leaflets** 3-6 x 1-2.5cm, inequilateral, 3-5 nerved at base, sparsely pubescent above, rusty-pubescent beneath, subacute-acuminate at base, acute and mucronate at apex. **Male flowers** usually on leafless branches, in 3-12 cm long, tomentose, sparsely prickled racemes; **pedicels** upto 0.2 cm long; **perianth** lobes 6, coriaceous, pubescent, hyaline along the margins, outer ones upto 0.2 cm long, inner one shorter, about 0.1 cm long; **stamens** 3 fertile with 3 staminodes and distinct pistillodes; **female flowers** in solitary spikes, upto 0.5 cm long, with upto 0.4 cm long oblong, ribbed, tomentose ovary, style upto 0.1 cm long and capitate stigma. **Capsules** almost 2 x 1 cm, oblong, angled, glabrous, 3-winged; **seeds** upto 0.7 x 0.4 cm, subquadrate, winged apically.

### Ecology

Climbers, common along river sides, valleys and openings in moist deciduous forests and also occasionally in the plains. Flowers are produced during August to December and fruits start dispersing seeds by October to January.



Map 63. Distribution of *Dioscorea pentaphylla* L. in



**Distribution****Kerala**

Cannanore, Wynad, Calicut, Malappuram, Palghat, Trichur, Emakulam, Idukki, Kottayam, Pathanamthitta, Quilon and Trivandrum districts; almost throughout the State, mainly in the mid and hilly uplands (Map 63).

**World**

Throughout the wetter parts of tropical Asia and eastwards to Pacific Islands.

**Notes**

Prain and Burkill (1914) had recognised few varieties under the species. In Kerala, varieties like *communis* Prain *et* Burk., *linnaei* Prain *et* Burk. and the typical form of the species are represented.

**Products and uses**

Underground tubers and aerial bulbils which are edible as vegetable are extensively extracted from the forests. They are eaten after repeated boiling and washing. Also, tubers are reported to be medicinal to dispense swellings (Anonymous, 1952) and as a tonic.

**References cited**

Anonymous, 1952. *The Wealth of India: Raw Materials*. vol. 3. CSIR, New Delhi p. 75.

Prain, D. and I.H. Burkill 1914. A synopsis of Dioscoreas of the Old World with descriptions of new species and varieties. *J. Proc. Asiat. Soc. Bengal (n.s.)* 10:5-41.

**64. DIOSPYROS MALABARICA (DESR.) KOSTEL.**  
( Ebenaceae )

**Nomenclature**

*Diospyros malabarica* (Desr.) Kostel, Allg. Med. Pharm. Fl. 3: 1099. 1834; Brink, Bull. Jard. Bot. Butzg. 15: 325. 1938; Kosterm., Ceylon J. Sci. 12(2): 103. 1977; Nicol. *et al.*, Intrap. Hort. Malab. 102. 1988.

*Garcinia malabarica* Desr, in Lamk., Encyl. Meth. Bot. 3: 701. 1972.

*Diospyros embryopteris* (*non* Spreng. *nec.* Bojer); Bedd., Fl. Sylvat. South. India t. 69. 1870; Hiern in Hook.f., Fl. Brit. India 3: 556. 1882; Bourd., For. Trees Trav. 222. 1908; Rama Rao, Fl. Pl. Trav. 239. 1914.

*Diospyros peregrina* (*non* Gurke); Gamble, Fl. Presid. Madras 2: 777. 1923; Krishnam., Min. For. Prod. India 194, 293, 348. 1993.

*Diospyros glutinosa* Koen. *ex* Roxb., Pl. Corom. 70. 1796; Wt., Ic. Pl. Ind. Orient. tt. 843, 844. 1844-45.

**Local name(s)**

Panichi, Panichi-kaya.

**Description**

**Trees**, upto 14 m high; **bark** black, rough, scaly; **branchlets** yellowish-tomentose, spreading. **Leaves** simple, alternate, 9-25 x 3-7.5 cm, oblong to lanceolate-oblong, obtuse or obtusely acuminate at apex, base contracted into the petiole, lower midrib prominent, upper midrib slightly impressed; **petioles** upto 1 cm long, slender, pilose. **Flowers** unisexual or polygamodioecious in axillary cymes on old branches or the female flowers solitary; **male flowers** yellow, 1-1.5 cm long, peduncle about 2 cm long, densely hairy; **pedicels** upto 0.4 cm long; **calyx** cup shaped with 4-5 ovate, acute lobes, 0.3-5 cm long; **corolla** tubular, 0.8-1.3 cm long with 4-5 lobes, about 0.3 cm long; **stamens** 24, 30, 40 or 64 in number, 0.8 cm long with rectangular attenuate anthers around the rudimentary villous pistil; **female flowers** upto 2 cm long; **calyx** with sepals upto 1.5 cm long, ovate, glabrescent; **corolla** upto 1.8 cm long, with petals recurved towards apex; **staminodes** 4, pilose and adnate to the corolla tube; **pistil** with yellowish green ovary, globose and densely pilose with 4 pubescent styles and lobed stigma. **Fruits** brown, subsessile or shortly pedicelled, upto 6 cm across, thickly tomentose, with persistent calyx and pericarp with ruby-red, gum; **seeds** 4 to 8, upto 2.5 cm long, elliptical and wedge shaped.

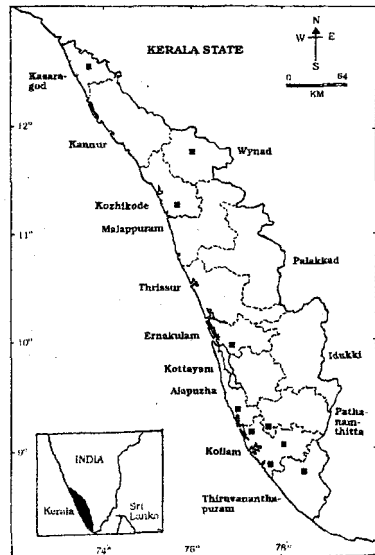
**Ecology**

Evergreen trees with black trunk, thick foliage and spreading crown, rather very rare in the natural forests of Kerala. The species is also rarely seen in the homesteads and especially in sacred groves. In habitat, the plant prefers to grow in lush vegetation, especially in wet areas close to river banks and sometimes near backwaters. Flowers during January to May and fruiting during June to December.

**Distribution**

Kerala

Kasaragod, Wyanad, Calicut, Ernakulam, Alleppy, Pathanamthitta, Quilon and Trivandrum districts; almost throughout the State, mostly in the low and midlands (Map 64).



Map 64 Distribution of *Diospyros malabarica* (Desr) Kostel. in Kerala

**World**

South India, Sri Lanka.

**Notes**

This species typified by the illustration of van Rheede (Hort. Malab. 3: 45-47. t. 41. 1682), namely 'Panitsjika-maram' was often confused with the Malesian species *Diospyros peregrina* (Gaertn.) Gruerke, which does not occur in India. In fact, binomials like *Embryopteris glutinifera* Roxb. (Pl. Corom. t. 70. 1796), *Diospyros embryopteris* Pers. (Syn. 2: 624. 1807) and *Diospyros glutinosa* Roxb. (1832) by which this species is referred to in Indian Floras, belong to the synonymy of the Malesian tree *Diospyros peregrina* and it was only a mistake that Gamble (1923) considered the South Indo-Sri Lankan endemic 'Panichi' tree as the Malesian species *Diospyros peregrina*. Roxburgh's (1796) inclusion of the plate No. 41 of Rheede (referred above) as the type of his name is also a similar error.

**Products and uses**

Bark is medicinal, used to cure dysentery and intermittent fevers. The fruit and stem-bark possess astringent properties. Infusion of fruits is used as gargle in aphthae and sore throat. Fruit juice is often applied to cure ulcers and wounds. Unripe fruits, rich in tannin, are employed for tanning hides and dyeing cloths, and the fruit gum is very specific for binding leather in drums. Pulped fruit is used as a preservative for fishing nets and as glue for book binding. Seed-oil is used as remedy for dysentery and diarrhoea. The velvety fruits are also reported (Krishnamurthy, 1993) to be edible and is the source of an yellow dye.

**Regeneration**

The tree is a shade-bearer, but is sensitive to fire, especially in the early years of growth. Also, young trees coppice well and produce root-suckers, Natural regeneration of the species is mainly by seeds which are dispersed by fruit-eating animals like bats and monkeys. The seeds germinate when they are fully or partially covered by soil. During June-July, seeding takes place and the seeds, if exposed to sun for a long period, seldom germinate and grow.

For artificial regeneration of the tree, seeds from fruits which ripen during June-July are used. Upto 4000 fruits are produced by a single tree and they can be collected when off the trees and the seeds extracted. Seeds on storage lose their viability within a year (Dent, 1948) and therefore fresh seeds have to be used for germination. About 750-874 seeds weigh one kilogram and germination percentage may go upto 82 (FRI, 1985). It takes about 25-30 days for the seeds to germinate. In nursery beds, fresh seeds are sown

during July, 10cm apart in drills. The drills are made in lines, 23 cm distant from each other (FRI, 1985). Seedlings can be field planted in the same or next rainy season with light shading initially. The growth of seedlings is rather slow, especially during the initial one or two years.

### References cited

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- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi. pp. 194, 348.
- Roxburgh, W. 1796. *Plants of the Coast of Coromandel*. vol. I. P.R.S. London. p. 70.

## 65 DIPTEROCARPUS INDICUS BEDD. ( Dipterocarpaceae )

### Nomenclature

- Dipterocarpus indicus* Bedd., Fl. Sylvat. South. Ind. t. 94. 1871; Bourd., For. Trees Trav. 35. 1908; Rama Rao, Fl. Pl. Trav. 34. 1914; Gamble, Fl. Presid. Madras 1: 81. 1915; Janardh. in Sharma. *et* Sanjapp. (ed.) Fl. India 3: 214. fig. 55. 1993; Krishnam., Min. For. Prod. India 280. 1993.
- Dipterocarpus turbinatus auct. non* Gaertn.f. (1805); Dyer in Hook.f., Fl. Brit. India 1: 295. 1874 (*proparte*).

### Local name(s)

Kal-payin, Vavangu, Vella-ayani.

### Description

Evergreen **trees**, upto about 40 m high; **trunk** straight, upto 4 m in girth, cylindrical; **branchlets** appressed tomentose. **Leaves** simple, alternate, 12-20 x 5-15 cm, ovate, entire, coriaceous, truncate-cordate at base, acute at apex with 10-15 pairs of lateral nerves. **Flowers** white, fragrant, upto 6 cm across, in axillary, 3-8 flowered racemes; **calyx** tubular, 5-lobed, with lobes valvate and two enlarged into spatulate wings of about 12 x 3 cm size, strongly 3-5 nerved and reticulate; **corolla** 5-lobed with narrowly oblong lobes; **stamens** many with filaments yellowish, variable in length and linear anthers tapering apically; **pistil** with ovary enclosed in the calyx tube, 2-3 locular, densely puberulent, style filiform, glabrous and small obscurely lobed

stigmas. **Fruits** nut-like, brownish, 1-2.5cm across, glabrous, winged by the enlarged sepal lobes.

**Ecology**

Gigantic trees mostly confined to the evergreen and semi-evergreen forests of Kerala, upto an altitude of about 1000m. Flowers are borne during December to April and fruits mature by April-May.

**Distribution**

Kerala

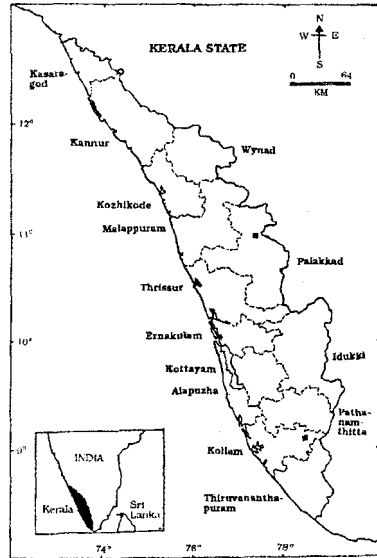
Palghat and Quilon districts; restricted to highlands, mostly where evergreen forests exist (Map 65).

World

Endemic to southern Western Ghats in Peninsular India.

**Products and uses**

The resin obtained from the trunk of the tree is used in the manufacture of varnishes and lithographic inks. It is also used in polishing woodwork, in caulking and also varnishing boats (Krishnamurthy, 1993). The resin is also reported (Janardhanan, 1993) as medicinal against rheumatic complaints.



Map 65. Distribution of *Dipterocarpus indicus* Bedd. in Kerala.

**Regeneration**

Eventhough viability period of seeds is low, when dispersed in natural conditions and especially in open areas, natural regeneration of the species is quite good. The naturally growing seedlings are tolerant to partial or complete shade and shade also prevents casualties of the seedlings (Kadambi, 1954) to a certain extent. Later, during sapling and pole stages, the plant requires abundant light for further development. Tending operations during the initial ten years can also enhance the survival and growth of naturally recruited saplings (FRI, 1980).

For artificial regeneration of the species, seeds can be collected during May-June, dispersed on the forest floor. Plumpy and heavy seeds, free of insect damages, are to be collected on a daily basis which can be stored in gunny bags for about a month (Luna, 1996). About 170fruits weigh one kilogram and germination rate of fresh seeds is about 90% (Luna, 1996) in Kerala

conditions, whereas in Tamilnadu, it is recorded to be only about 41 percent. In the nursery beds, seeds are to be sown in drills, 10 x 10 cm apart, with their apex downwards. Chipping off the wings partially has also to be done before sowing. Germinating seeds are preferably used for sowing in shaded nurseries and the seedlings attain a height of about 40-45 cm within a year (Luna, 1996). Three months, six months or one year old seedlings can be field planted, eventhough one year old seedlings perform better. At Nilarnbur in Kerala State, planting of six months old seedlings recorded about 73% survival. Basketted and naked root entire transplants or mossed seedlings can also be used for the regeneration of the species and sowing of seeds in natural forests after removing middle canopy is also (Luna, 1996) found successful.

### References

- FRI, 1980, *Troup's Silviculture of Indian Trees*. vol. 2. Controller of Publications, Delhi. pp. 348-357.
- Janardhanan, K.P. 1993. Family *Dipterocarpaceae*. In: B.D. Sharma et M. Sanjappa (ed.) *Flora of India*. vol. 3. Botanical Survey of India, Calcutta. p. 216.
- Kadambi, K. 1954. *Dipterocarpus indicus* Bedd. (*syn. D. turbinatus* Gaertn.) - its silviculture and management. *Indian For.* 80(5): 264-276.
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- Luna, R. K. 1996. *Plantation Trees*. International Book Distributors, Dehra Dun. pp. 321-323.

## 66. DYSOXYLUM MALABARICUM BEDD. EX HIERN ( Meliaceae )

### Nomenclature

*Dysoxylum malabaricum* Bedd. ex Hiern in Hook.f., Fl. Brit. India 1: 548. 1875; Bourd., For. Trees Trav. 72. 1908; Rama Rao, Fl. Pl. Trav. 73. 1914; Gamble, Fl. Presid. Madras 1: 178. 1957.

### Local name(s)

Vella-agil.

### Description

**Trees**, 20-40 m high; **branchlets** slightly puberulous. **Leaves** alternate or subopposite, abruptly pinnate with angular rachis; **leaflets** 4-5 pairs, alternate or subopposite, 7-18 x 3.5-5 cm, elliptic-oblong, entire, puberulous when young, 12-20 lateral nerved, rounded at base, acuminate at apex; **petiolules** 0.5-1.2 cm long, stout. **Flowers** greenish yellow, **0.6-0.7** cm long, in axil-

lary, racemiform panicles upto 15 cm long; **pedicels** upto 1 cm long; **calyx** 4-lobed, finely pubescent externally with ovate, acute lobes; **corolla** of 4 linear-oblong, imbricate lobes, acute at apex, connate to the staminal tube at base; **stamens** united into a staminal tube with 8 deep, emarginate crenatures and 8 anthers alternate to the crenatures; **pistil** surrounded by cupular, truncate or irregularly toothed disc with densely pubescent, 4-loculed ovary tapering into the style and capitate, 4-lobed stigma. **Capsules** yellow, upto 5 cm in diameter, pyriform, verrucose, 2-4 seeded; **seeds** reddish-brown, bluntly trigonous.

**Ecology**

Rare, but dominant trees forming part of the top canopy in the semi-evergreen and evergreen forests of Kerala, often attaining large dimensions. Flowers during March-April and fruits mature by June-July.

**Distribution**

Kerala

Wynad, Palghat, Ernakulam, Idukki, Pathanamthitta and Quilon districts; almost throughout the State, mainly in the highlands (Map 66).

World

Peninsular India.

**Notes**

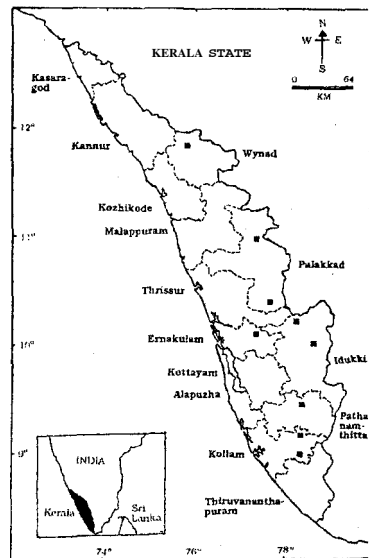
This species has not been dealt with by Krishnamurthy (1993) as yielding non-timber forest produce of medicinal value.

**Products and uses**

This is the White Cedar tree, whose timber is very much reputed. Medicinally, decoction of the wood is used in the treatment of rheumatism and the wood-oil is curative of ear and eye diseases. Match boxes, splints, cigar boxes, etc. are also made from the wood of this tree (Anonymous, 1952).

**Regeneration**

The tree regenerates naturally from seeds contained in the fallen fruits, unless removed or destroyed by wild animals which is quite prevalent. Also, clearing the forest floor below mother trees and weeding the seed falling area till the seedlings reach sapling stage can improve the natural regenera-



Map 66. Distribution of *Dysosyllum malabaricum* Bedd. ex Hiem in Kerala.

tion of the species (FRI, 1981) and once the sapling stage is attained, the plants require more sunlight for better growth. However, natural regeneration of the tree in Kerala forests is inadequate on account of the removal of seeds by squirrels, porcupines, monkeys and such wild animals.

For artificial regeneration of the species, seeds can be collected during June-July from ripened fruits which turn black and mouldy in damp weather, affecting the germination capacity of seeds. The seeds also lose their viability on storage (FRI, 1981), especially in dry gunny bags, whereas wet bags can help to retain their viability for about six weeks (FRI, 1981). Seeds are to be sown during July in nursery beds and within 70 days, germination will be completed. Fungus attack is a serious problem affecting the viability and germination capacity of seeds, especially in wet conditions. The seedlings, which attain a height of about 30-35 cm by the next rainy season, can be field planted.

### References cited

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- FRI, 1981. *Troup's Silviculture of Indian Trees*. vol. 3. Controller of Publications, Delhi. pp. 166-168.
- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi.

## 67. ELETTARIA CARDAMOMUM (L.) MATON ( Zingiberaceae )

### Nomenclature

*Elettaria cardamomum* (L.) Maton, Trans. Linn. Soc. London 10: 254. 1811; Baker in Hook. f., Fl. Brit. India 6: 251. 1892; Rama Rao, Fl. Pl. Trav. 403. 1914; Fisch. in Gamble, Fl. Presid. Madras 3: 1491. 1928; Burt et Smith, Notes Roy. bot. Gardn. Edinburgh 31: 182. 1972; Krishnam., Min. For. Prod. India 147, 158. 1993.

*Amomum cardamomum* L., Sp. Pl. 1: 1753.

*Alpinia cardamomum* (L.) Roxb., Asiat. Res. 11: 355. 1810 & Pl. Corom. t. 226. 1819.

*Elettaria cardamomum* (L.) Maton var. *minus* Watt, Cousm. Prod. India 512. 1908; Burk., Kew Bull. 1930: 35. 1930.

### Local

Eelam. Eelakka.



**Description**

Perennial **herbs** with rootstock and aerial, leafy pseudostem, upto 3 m high, clothed below with spongy sheaths; **rootstock** branched, woody or fleshy. **Leaves** simple, alternate, subsessile, upto 20-50 x 3-5.5 cm, linear-lanceolate, sheathy, glabrous above, slightly pubescent or subglabrous beneath, acuminate at apex; **petioles** 15-25 cm long, glabrous; **ligule** almost 1 cm long, entire, glabrous. **Flowers** white with pinkish striations in prostrate or erect, stalked panicles of about 35-40 cm length, arising from the rootstock; **bracts** 2-3 x 0.8-1 cm, lanceolate, glabrous, almost persistent, fimbriate on aging, acute at apex; **bracteoles** upto 2.2 cm long tubular, glabrous, mucronate at apex; **calyx** upto 2 cm in length, obscurely 2-3 lobed with the lobes mucronate at apex; **corolla** tubular, almost 2 cm in length, lobed upto 1.5 cm in length and mucronate at apex, with the dorsal lobe the widest; **labellum** white streaked with violet, upto 2 x 1 cm, obovate, obscurely 3-lobed, narrowed towards the base and anthers sessile with thecae upto 1 cm long, and the lateral staminodes inconspicuous and subulate; **pistil** with ovary upto 0.2-0.3 cm in length, glabrous, oblong-ovoid, 3-loculed with filiform style and funnel-shaped, ciliate stigma. **Capsules** pale green to yellow, 0.4-0.8 x 0.3-0.6 cm, subtrigonous to oblong or subglobose; **seeds** 15-20, brownish-black, 0.1-0.2cm long, angled and rugose, covered with a thin mucilaginous membrane.

**Ecology**

The plant is seen in natural condition as an undergrowth in the evergreen and semi-evergreen forests of Kerala, at medium and high elevations; also cultivated in the forest types between 800-1800m elevations. Flowers are borne during October to May and fruits ripen by June.

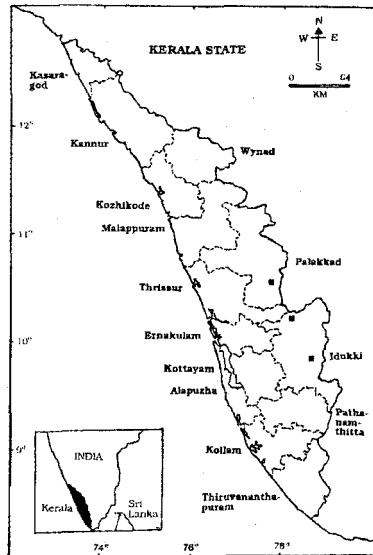
**Distribution**

**Kerala**

Palghat, Idukki and Trivandrum districts; confined to the hilly uplands and highlands (Map 67).

**World**

Peninsular India, Sri Lanka, Myanmar, Cochin-China and Malayan Archipelago.



Map 67. Distribution of *Elettaria cardamomum* (L.) Maton in Kerala.

### **Products and uses**

Cardamom of commerce is the dried fruits (seeds) of this plant. It is a well known spice and masticatory, used also in medicine. It is used to flavour food items, liquors and also beverages like coffee. In medicine, cardamom is used as a adjuvant to carminative drugs (Anonymous, 1952) and as an aromatic stimulant. Powdered seeds of the plant mixed with ginger and caraway is also an effective stomachic. It is the essential oil component of the seeds that gives the aromatic and therapeutic properties. Cardamom oil of commerce is yet another product obtained from the plant by distillation of whole fruits. The oil is used for flavouring beverages and form a component of compounds like Cardamom spirit and Vanillin spirit.

Due to excessive demand of Cardamom, the species is extensively cultivated in the evergreen and semi-evergreen forest areas of Kerala.

### **Production and marketing**

Cardamom of commerce and also other products from it, mostly come from the forest plantation sector. However, in small quantities, the product is also collected from natural forest areas. Dried fruits, dried seeds, seed oil and an oleo-resin extracted from the seeds are the cardamom products exported from India. Shiva, *et al.* (1996) had reported that about 3210 tonnes of such products were exported from the country during 1980-81, worth Rs. 346.6 million. However, during 1990-91, this was reduced to about 1878 tonnes costing Rs. 266.4 million, of which the oleo-resinous component alone constituted about 1.23 tonnes worth Rs. 1.05 million. Details on the export of cardamom products from India during 1940-41 to 1950-51 is also available (Anonymous, 1952). From the natural forests of Kerala, about 6559 kg of cardamom was collected and sold to Kerala State SC & ST Federation (1998) during 1994-95 to 1996-97.

### **Regeneration**

Cardamom plants can be propagated using rhizomes or by seedlings. Rhizomes of large clumps are removed and separated into small propagules having a portion of the rhizome and atleast one mature and one young shoot, which can be field planted in pits (Anonymous, 1952). Seedlings, which come up in wild or in old cardamom plantations, can also be collected and planted in nursery beds for later shifting to the field.

From ripened capsules of plants above the age of five years, seeds can be collected for raising seedlings. About 50000-65000 seeds weigh one kilogram and, on an average, about 20000-25000 seedlings will be available on their germination. The seeds are either cleaned using water and sown immediately or are mixed with ash and dried for 2-9 days in shade, before sowing. Nurseries are usually taken near streams to ensure watering facility. Seeds are broadcast sown on nursery beds covered with loose soil, mostly during

August to October. The seeds germinate within 6-7 weeks after sowing (Anonymous, 1952) and the nursery beds, if maintained properly, will produce seedlings occasionally upto one year from the date of sowing. Seedlings, when 4-5 months old, are to be pricked out and planted 15-30 cm apart in new beds, where they are allowed to grow for about two years before field planting by the onset monsoon.

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- Kerala State SC & ST Federation 1998. Different items of LFPP handled during 1994-95 to 1996-97 and price fixed by MFP Committee per kilogram for 1997-98. Trivandrum (unpublished).
- Shiva, M.P., S. Aswal, A. Sharma, P. Mathur and R. Chandra 1996. *Trends of Export and Import of the Minor Forest Products in India*. Centre for Minor Forest Products, Dehra Dun. 38 p.

## 68. EMBELIA RIBES BURM. F. (Myrsinaceae)

### Nomenclature

*Embelia ribes* Burm. f., Fl. Indica 62, t. 23. 1768; Clarke in Hook. f., Fl. Brit. India 3: 513. 1882; Rama Rao, Fl. Pl. Trav. 233. 1914; Gamble, Fl. Presid. Madras 1: 529. 1921; Krishnam., Min. For. Prod. India 55. 1993.

*E. glundulifera* Wt., Ic. Pl. Ind. Orient. t. 1209. 1848.

### Local

Vizhal, Sithari, Thiruvittikkanni, Vayvillankam, Vishalam.

### Description

**Lianas** with stems tuberclcd; **branchlets** slender and white. **Leaves** simple, alternate, upto 7 x 3 cm, elliptic-lanceolate, entire with many, parallel nerves; **petioles up** to 1 cm long, grooved above. **Flowers** small, white, in axillary or terminal panicles; **pedicels** upto 1.5 cm long; **calyx** lobes 5, sepals triangular, tomentose, minute, ciliate; **corolla** tube short, lobes 5, each 0.2 cm long, ovate, puberulous, acute; **stamens** 5, subexserted with filaments 0.4 cm long and minute anthers; **pistil** with ribbed ovary and short style. **Berries** upto 0.3 cm across, globose.

### Ecology

Common in evergreen and semievergreen forests at high elevations, occasionally extending to shola forests and thickets in the adjoining high altitude grasslands. The plant flowers and fruits during January to May.

## Distribution

### Kerala

Palghat and Malappuram districts (Map 68).

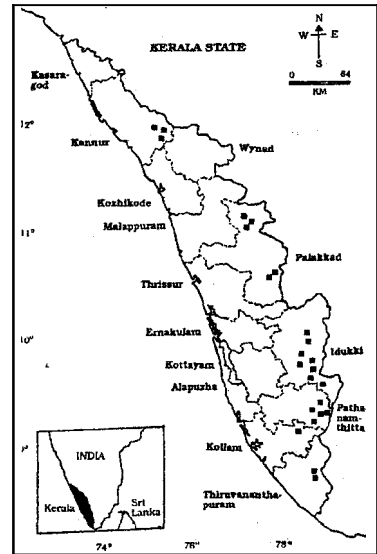
### World

Throughout India, Sri Lanka, Malaya and southern parts of China.

## Products and uses

Dried berries, which forms the official part are acrid, strongly anthelmintic, astringent and carminative, used for constipation, colic, dyspepsia, ascites, bronchitis, mental diseases, heart ailments, urinary troubles, jaundice, hemierania, flatulence, piles and snake bite. Aquous extract of the fruits also show antibacterial activity against *Staphylococcus aureus* and *Escheretia coli*. Seed powder is also medicinal as an errhine in cold and colic (Anonymous, 1950). Powdered seeds administered at bed time in curdle milk, followed by a dose of castor oil on the following morning is reported (Nadakarni, 1976) to be a very effective remedy to check tape-worm infection.

Consumption of root decoction, twice or thrice a day had proved to be very effective in controlling influenza epidemic. Dried and powdered bark is also a reputed remedy for tooth ache (Nadakarni, 1976). Recently, the plant products are also subjected to experimental and clinical trials for its contraceptive properties (Krishnamurthy, 1993).



Map 68. Distribution of *Embelia ribes* Burm.f in Kerala.

## Production and marketing

The marketed non-wood produce from *E. ribes* is the dried fruits of the plant. The collection network of Kerala State SC & ST Federation (1998) gathered about 20,206 kg of the produce from the natural forests of the State which they procured at a cost of Rs. 7.60 per kg and was sold for Rs. 8.00 per kilogram.

## References cited

- Anonymous, 1950. *The Wealth of India: Raw Materials*. v ol. 2. CSIR, New Delhi. pp. 149-160.
- Kerala State SC & ST Federation 1998. Different items of LFPP handled during 1994-95 to 1996-97 and price fixed by MFP Committee per kilogram for 1997-98. Trivandrum (unpublished).

- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi. pp. 55.
- Nadkarni, A. K. 1976. *Indian Materia Medica*. vol. 1. Popular Prakashan, Bombay. pp. 478-480.
- Shiva, M.P., S. Aswal, A. Sharma, P. Mathur and R. Chandra 1996. *Trends of Export and Import of the Minor Forest Products in India*. Centre for Minor Forest Products, Dehra Dun. 38 p.

**69. ENTADA RHEEDII SPRENG.**  
( Mimosaceae )

Nomenclature

- Entada rheedii* Spreng., Syst. Veg. 325. 1825; Panigrahi, Taxon 34: 714. 1985; Nicol. *et al.*, Intrap. Hort. Malab. 135. 1988.
- Entada pursaetha* DC., Prodr. 2: 425. 1825 (*excl. syn. non nullis*); Wt. *et Arn.*, Prodr. 267. 1834; Brenan, Kew Bull. 1955: 164. 1955; Sant., J. Bombay nat. Hist. Soc. 57: 239. 1960; Sant. *et Janardh.*, Bull. bot. Surv. India 3: 16. 1962; Brenan, Kew Bull. 20: 363. 1966.
- Entada scandens auct. non* (L.) Benth.; Baker in Hook.f., Fl. Brit. India 2: 287. 1878 (*pro parte*); Bourd., For. Trees Trav. 134. 1908; Rama Rao, Fl. Pl. Trav. 147. 1914; Gamble, Fl. Presid. Madras 1: 417. 1914.
- Mimosa entada* L., Sp. Pl. 518. 1753.
- Entada phaseoloides auct. non* (L.) Merr; Sant., Rec. bot. Surv. India 17: 94. 1953; Krishnam., Min. For. Prod. India 197. 1993.
- Entada schefleri* Ridl., J. Bot. 58: 195. 1920; Calder *et al.*, Rec. bot. Surv. India 11(1): 49. 1926.

Local name(s)

Cillu, Irikki, Kakka-valli.

Description

Woody climbers, upto 30 m high; branchlets terete, glabrous. Leaves opposite, bipinnate with 5-8 cm long, grooved, glabrous rhachis, often ending in bifid tendrils; leaflets 3-7.5 x 1.5-3 cm long, oblong or obovate-oblong, rigidly coriaceous, glabrous, dark green above, pale beneath, subacute at base, often emarginate at apex; petiolules upto 0.2 cm long, stout. Flowers yellow or white in simple or paniced, 10-35



Fig. 23. *Entada rheedii* Spreng.

35 cm long spikes, axillary or at nodes of leafless branches; **calyx** campanulate, about 0.1 cm long, minutely 5-toothed; **corolla** upto 0.2 cm long with 5, valvate petals; **stamens** 10, free, slightly exerted with anthers crested with deciduous glands; **pistil** with subsessile ovary, filiform style and terminal, concave stigma. **Pods** upto 80 x 15 cm, thick, slightly curved, woody with thick sutures, indented between seeds; **seeds** brown, 6-15, 4.5-5.5 cm across, orbicular, compressed, smooth (Fig. 23).

### Ecology

Gigantic lianas, rarely seen along the sides of ravines, in forest depressions and similar habitats, mostly in evergreen, semi-evergreen and moist deciduous forests. often climbing on more than one tree and spreading the foliage on top of their canopy. The plant flowers mostly in the summer months of December to March and large fruits may be seen persistent throughout the year.

### Distribution

#### Kerala

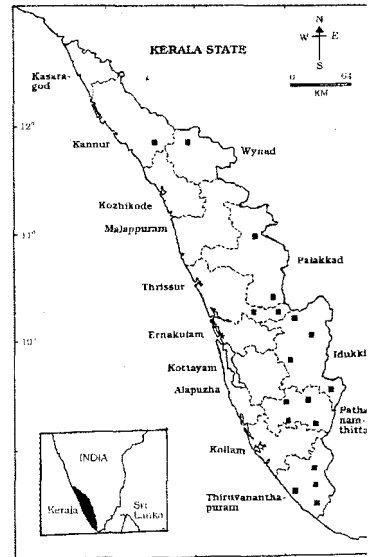
Cannanore, Wynad, Palghat, Trichur, Idukki, Pathanamthitta and Trivandrum districts, almost throughout the State, mainly in the mid and highlands (Map 69)

#### World

East and West Africa to India, extending eastwards to China, Guam, New Guinea and northern Australia.

### Notes

This species goes under the name *Entada scandens* in Indian Floras *Entada scandens* is a synonym of *Entada phaseoloides* (L.) Merr, as clarified by Santapau (1960) However, *Entada phaseoloides* does not occur in India (confined to Amboina and Moluccas) and it is *Entadu pursaetha* DC. which is found in western part of the country. In fact, *Entada scandens* is a superfluous name of *Lens phaseoloides* L., as clarified by Panigrahi (1985) and the binomial *E phaseoloides* is a combination based this basionym.



Map 69 Distribution of *Entada rheedii* Spreng in Kerala

*Entada pursaetha* DC. is the name accepted for the Indian species by Brenan (1955, 1966), Santapau (1960) and Santapau and Janarthanan (1962). Even though, their identification is correct, the name *Entada pursaetha* DC. hap-

pens to be a later synonym of *Entada rheedii* Spreng. in the sense that Sprengel's publication of the name was in January-May, 1825, whereas de Candolle validly published the binomial *Entada pursaetha* in November, 1825. Therefore, *Entada rheedii* Spreng. is accepted here as the upto date name of the species. It is the typical form of the species namely *Entada rheedii* Spreng. subsp. *pursaetha* which is widely distributed in Peninsular India especially in the Western and Eastern Ghats, extending upto Orissa (also Thailand and Malayasia), but does not reach the Himalayan region where subspecies *Entada rheedii* Spreng. subsp. *sinohimalensis* (Grierson *et* Long) Panigrahi is found, which extends to Yunan and Bangladesh in its distribution.

### Products and uses

Seeds of this plant are exploited for medicinal uses and as fish poison and detergent. Also, the roasted and powdered seeds are used as a substitute for coffee. Krishnamurthy (1993) has noted that the hard endosperm of the seed is scooped out and the shell is made into snuff boxes. Also, the kernal of the seed is edible. The Stem of the plant, cut into small pieces and softened, is used as a substitute for soap and as a cleaning material.

### Production and marketing

From the natural forests of Kerala, the seeds of the plant is extracted as a non-wood produce. The Kerala State SC & ST Federation (1998) received more than 1,54,583 kg of the dried seeds through its various collection points throughout the State, during 1994-95 to 1996-97, at the rate of around Rs. 5.00per kilogram.

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- Brenam, J.P.M. 1966. The genus *Entada*, its sub divisions and a key to the African species. *Kew Bull.* 20: 361-378.
- Kerala State SC & ST Federation, 1998. Different items of LFPP handled during 1994-95 to 1996-97 and price fixed by MFP Committee per kilogram for 1997-98. Trivandrum (unpublished).
- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi. p. 456.
- Panigrahi, G. 1985. Proposal to amend the type citation of *Entada* Adans. and of *Gibbalobium* Browne. *Taxon* 34: 714.
- Santapau, H. 1960. The identity of the *Entada* plants from Bombay. *J. Bombay nat. Hist. Soc.* 57: 238-240.
- Santapau, H. and K.P. Janardhanan 1962. Critical notes in the identity and nomenclature of some Indian plants. *Bull. bot. Surv. India* 3: 11-21.

**70. EUPHORBIA THYMIFOLIA L.**  
(Euphorbiaceae)

**Nomenclature**

*Euphorbia thymifolia* L., Sp. Pl. 454. 1753; Hook. f. in Hook. f., Fl. Brit. India 5: 252. 1887; Rama Rao, Fl. Pl. Trav. 35 1. 1914; Gamble, Fl. Presid. Madras 2: 1276. 1925; Airy Shaw, Kew Bull. 26: 267. 1972; Nicol. *et al.*, Intrap. Hort. Malab. 110. 1998.

**Local name(s)**

Chittrappala, Nilappala, Therucalli.

**Description**

Annual, prostrate. **herbs** with divaricate hairy branches, upto 15 cm long; **branchlets** slender, cylindrical, hispidly pubescent. **Leaves** simple, opposite, distichous, subsessile, upto 0.5 x 0.2, obliquely suborbicular or oblong, serrulate, sparsely pubescent beneath, oblique-cordate at base, obtuse or rounded at apex. **Flowers** white 'in axillary, solitary or clustered cyathia; **involucres** upto 0.8 x 0.6 cm, campanulate, minutely 4-glandular; **male flowers** ebracteolate, shortly stalked with anthers upto 0.2 cm long; **female flowers** laterally pendulous with upto 0.8 cm long with tomentose ovary and style 3-forked from base. **Capsules** about 0.1 cm across, obtusely keeled, pubescent; **seeds** minute, 4-angled, 5-6 transverse furrowed, bluntly pointed (Fig. 15).

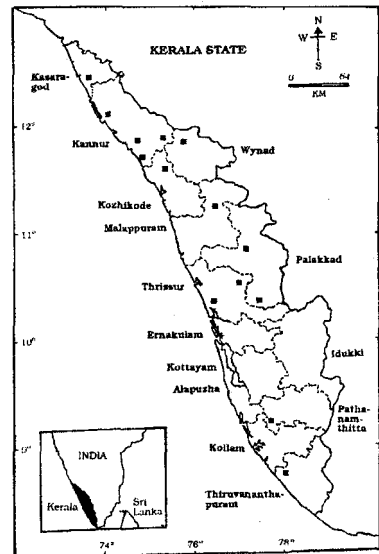
**Ecology**

A prostrate, much branched annual of open areas which produces flowers and fruits mainly during July to March, but sometimes almost throughout the year. The plant is common in dry, open areas of moist deciduous forests and also in waste places.

**Distribution**

Kerala

Kasaragod, Cannanore, Wynad, Calicut, Malappuram, Palghat, Trichur, Pathanamthitta and Trivandrum, districts; almost throughout the State, mainly in the low and midlands (Map 70).



Map 70. Distribution of *Euphorbia thymifolia* L. in Kerala.



World

Tropical Asia.

### Products and uses

Almost all parts of the plant are medicinally useful. The dried leaves and seeds are aromatic with stimulant, astringent, anthelmintic and laxative properties. Seeds also yield an essential oil used in the manufacture of medicated soaps, repellent of flies, mosquitos, etc. and as a vermifuge for dogs and farm-foxes (Anonymous, 1952). The roots are also reported to be useful in the treatment of amenorrhoea (Nambiar *et al.*, 1985). This species, all parts of which are extracted for medicinal use, is an addition to Krishnamurthy's (1993) account of the non-timber forest produce plants of India

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- Nambiar, V.P.K., N. Sasidharan, C. Renuka and M. Balagopalan., 1985. Medicinal Plants of Kerala Forests. *KFRI Research Report No. 42*. Peechi. p. 123.

## 71. GARCINIA CAMBOGIA (GAERTN.) DESR. (Guttiferae)

### Nomenclature

*Garcinia cambogia* (Gaertn.) Desr. in Lamk., *Encyl. Meth. Bot.* 3: 701. 1792; Wt. *et Arn.*, *Prodr.* 100. 1834; Wt.,  *Ic. Pl. Ind. Orient.* t. 960. 1845; Bedd., *Fl. Sylvat. South. India* t. 85. 1869-73; Anders. in Hook.f., *Fl. Brit. India* 1: 262. 1874; Bourd., *For. Trees Trav.* 20. 1908; Rama Rao, *Fl. Pl. Trav.* 28. 1914; Dunn in Gamble, *Fl. Presid. Madras* 1: 73. 1915; Sealy, *Kew Bull.* 1956: 341. 1956; Mahes., *Bull. bot. Surv. India* 6: 129. 1964.

*Mangostana cambogia* Gaertn., *Fruct.* 2: 106. 1790.

*Garcinia gummi-gutta sensu* Robs., *Brittonia* 20: 103. 1968; Kosterm., *Ceylon J. Sci.* 12: 55. 1976; Nicol. *et al.*, *Intrp. Hort. Malab.* 82-83. 1988; Singh in Sharma *et Sanjapp.* (ed.) *Fl. India* 3: 109. 1993.

*Garcinia roxburghii* Wt., *Ill. Ind. Bot.* 1: 125. 1840 (*proparte*).

*Garcinia cambogia* (Gaertn.) Desr. var. *conucarpa* (Wt.) Anders. in Hook.f., *Fl. Brit. India* 1: 262. 1874.

### Local name(s)

Koda-puli, Kodam-puli, Meen-puli, Pinam-puli, Punnangan, Puram-puli.

## Description

**Trees**, 8-12 m high with horizontal or drooping branches and rugose, dark brown bark **branchlets** glabrous. **Leaves** simple, opposite, 6.5-13 x 2.5-7 cm, oblong, elliptic or lanceolate, thick, shining dark green, glabrous cuneate at base, acute or obtusely short-acuminate at apex; **petioles** 0.5-1 cm long stout, light green. **Flowers** white with a yellowish tinge, male or hermaphrodite and female; **male flowers** in axillary fascicles; **pedicels** 0.7-1.2 cm long, thickened towards apex, reflexed; **calyx** with 4, ovate or obovate, coriaceous sepals, membranous along the margins; **corolla** of 4, obovate or oblong, concave petals; **stamens** 12-20 or more with short filaments and bilocular, obtuse anthers; **rudimentary pistil** minute or absent; **female and hermaphrodite flowers** 1-3, in terminal or axillary, short-pedicelled clusters; **staminodes** 10-12, with unequal filaments connate at base into unequal bundles and often empty anthers; **pistil** with subglobose or conoid, 8-11 locular ovary and 8-11 rayed crenate, irregular or tuberculate stigmas. **Berries** yellow, upto 7 cm across, almost globose, 6-8 grooved upto the middle from base, mamillate, thick; **seeds** 6-8, about 1.5 cm long, ovoid with white or red, succulent aril (Fig. 24).



Fig. 24. *Garcinia cambogia* (Gaertn.) Desr.

## Ecology

Trees with regular, horizontal branches and dense crown, common along river banks, valleys and depressions of moist deciduous, semi-evergreen and evergreen forests. Flowers are produced during February-March and fruits ripen by July-August.

## Distribution

### Kerala

Cannanore, Wynad, Calicut, Malappuram, Palghat, Trichur, Ernakulam, Idukki, Kottayam, Pathanamthitta, Quilon and Trivandrum districts; almost throughout the State (Map 71).

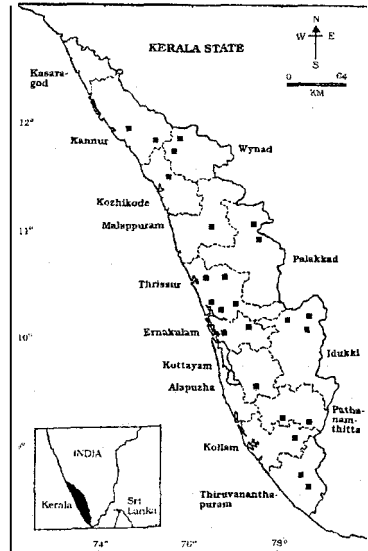
### World

Peninsular India, Sri Lanka, Malaysia.

## Notes

A detailed discussion on the identity and nomenclature of this species is given by Shinde and Almeida (1995), as against Nicolson, *et al.* (1988) who justified the usage of the name *G. gummi-gutta* (L.) Robs. for the Coddampuli plant of van Rheede (Hort. Malab. 1:41-2 t. 24.1678). The argument of Shinde and Almeida (1995) is accepted here.

Under the species *Garcinia cambogia*, Maheswari (1964) had recognised four varieties, viz. var. *cambogia*, var. *zeylanica* (Roxb.) Vesq., var. *conicarpa* (Wt.) T. And. and var. *papilla* (Wt.) T. And., of which, except for the var. *zeylanica*, all other varieties are distributed in Peninsular India. The specimens examined here are with 15-20 specimens, and therefore, can be referred to var. *cambogia*, which is the var. *gummi-gutta* of Singh (1993) who considered *G. gummi-gutta* as the correct name of the species and therefore the name of the typical variety.



Map 71. Distribution of *Garcinia cambogia* (Gaertn) Dcsr. in Kerala.

## Products and uses

Rind of fruits is the main non-timber product extracted from the plant. The rind, dried in sun and smoke, is extensively used as a souring agent (condiment) in curries. Due to the organic acid content, fruit rind is also used for polishing gold and silver ornaments (Anonymous, 1956) and also as a substitute to formic or acetic acid to coagulate rubber latex. Decoction of the fruit rind is also medicinal in the treatment of rheumatism, bowel complaints, piles, etc. Seeds of the tree contain about 31% of an edible fat resembling Kokam butter (Krishnamurthy, 1993). Also, bark of the tree yield a yellow resin soluble in turpentine to produce a yellow varnish.

## Regeneration

The tree naturally regenerates from seeds and can also be propagated artificially by raising seedlings (FRI, 1975), of which more details are not available.

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- Singh, N.P. 1993. Famil *Clusiaceae*. In: B.D. Sharma et M. San'a pa (ed) *Flora of India*. vol. 3. Botanical Survey of India, Calcutta. pp. 106-111.

**72. GARCINIA GUMMI-GUTTA (L.) ROBS.**  
( *Guttiferae* )

**Nomenclature**

- Garcinia gummi-gutta* (L.) Robs., Brittonia 20: 103. 1968 (*proparte, incl. type, excl. deser.*); Shinde et Almd., J. Eco. Tax. Bot. 19(2): 475. 1995.
- Combogia gummi-gutta* L., Gen. Pl. ed. 5: 522. 1974.
- Garcinia morella* (Gaertn.) Desr. in Lamk., Encycl. Meth. Bot. 3: 701. 1792; Bedd., Fl. Sylvat. South. Ind. t. 86. 1869; Anders. in Hook.f., Fl. Brit. India 1: 264. 1874; Bourd., For. Trees Trav. 20. 1908; Rama Rao, Fl. Pl. Trav. 29. 1914; Gamble, Fl. Presed. Madras 1: 73. 1915; Mahes., Bull. bot. Surv. India 6: 112. 1964; Singh in Sharma et Sanjapp. (ed.) Fl. India 3: 119-120. 1993; Krishnam., Min. For. Prod. India 203,281,295,296, 350. 1993.
- Mangostana morella* Gaertn., Fruct. 2: 106. 1790.
- Garcinia gutta* Wt., III. Ind. Bot. 1: 126, t. 44. 1839 (*non Combogia gutta* L. 1752).
- Garcinia cambogioides* Royle, Mat. Med. (ed.3): 339. 1832.
- Hebradendron combogioides* Grah. in Hook., Comp. Bot. Mag. 2: 199. t. 27. 1836.

**Local name(s)**

Chigiri, Daramba, Karukkam-puli, Pinnar-puli.

**Description**

**Trees**, upto 15 m high; **bark** ferruginous, yellow specked; **branchlets** tetragonous, thick, pale green, polished. **Leaves** simple, opposite, 8-12 x 3-5.5 cm, oblong or elliptic-lanceolate, entire, prominently nerved, glabrous and shiny above, pale green beneath, acute or decurrent at base, broad and obtuse-acuminate at apex; **petioles** upto 5 mm long, glabrous, green. **Male flowers** 2-5, in axillary fascicles of fallen leaves; **calyx** of 4 orbicular sepals, each upto 0.5 x 0.3 cm, concave, coriaceous; **corolla** of 4 petals, longer than

the sepals; **stamens** about 24, closely packed on a central receptacle with short filaments and depressed, peltate anthers; **pistil** absent. **Female flowers** yellow, solitary, axillary, sessile or shortly pedicelled with calyx and corolla as in the male flowers; **staminodes** 18-30, confluent at base into a ring; **pistil** with oblong, 4-locular ovary and sessile, irregularly lobed stigma. **Fruits** almost 2 cm in diameter, subglobose, surrounded by persistent sepal lobes at base; **seeds** dark brown, ovoid-reniform, slightly compressed.

**Ecology**

Graceful trees with dense crown and almost horizontal branches, common along the sides of water courses and in openings of moist deciduous forests. Flowers during March to May and fruits ripen by June-July.

**Distribution**

Kerala

Cannanore, Wynad, Malappuram, Palghat, Trichur, Idukki, Pathanamthitta, Quilon and Trivandrum districts; almost throughout the State, mainly in the mid and hilly uplands (Map 72).

World

India, Bangladesh, Sri Lanka, Myanmar, Thailand, Malacca.

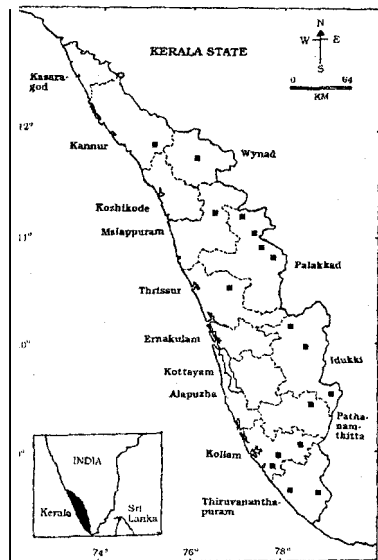
**Notes**

Recently, Shinde and Almeida (1995) have explained as to how *G. gummi-gutta* (L.) Robs. becomes the correct

Desr. in Indian Floras and also the binomial accepted by Maheswari (1964) for the species in his revision of the genus *Garcinia* L. for India.

**Products and uses**

The tree is the source of gamboge - an yellow exudate - mainly available from the pith bark, leaves, flowers and fruits. It is used as a pigment, for the preparation of water colours and as varnish for gold coloured metals. It is also used in the making of an yellow ink. Seeds of *G. gummi-gutta* yield 30% of a fat which is brownish yellow with a pleasant odour and is used in confectionaries and for cooking. The yellow pigment morellin also shows antibacterial activities.



Maps 72 Distribution of *Garcinia gummi-gutta* (L.) Robs. in Kerala.

Medicinally gamboge is reported to be used as a hydrogogue and drastic cathartic anthelmintic, in constipation, anasarca and other dropsical affections (Singh, 1993).

### Production and marketing

Dried and smoked rinds of ripened fruits is the product extracted and marketed, which is coming from both forest and non-forest areas of the State. From forest areas, during 1994-95 to 1996-97, about 8746 kg of the dried product was procured by the Kerala State SC & ST Federation (1998) at the rate of Rs. 85.50 per kg which was marked for Rs. 90.00 per kilogram. In small quantities, ripened fruits without drying is also handled by the Federation at the rate of Rs. 30.00 per kilogram during the period.

### References cited

- Anonymous, 1956. *The Wealth of India: Raw Materials*. vol. 4. CSIR, New Delhi. p. 105.
- Kerala State SC & ST Federation 1998. Different items of LFPP handled during 1994-95 to 1996-97 and price fixed by MFP Committee per kilogram for 1997-98. Trivandrum (unpublished).
- Maheswari, J.K. 1964. Taxonomic studies on the Indian Guttiferae - 3. The genus *Garcinia* Linn. *Bull. bot. Surv. India* 6: 107. 115, pl. 4.
- Shinde, R.D. and S.M. Almeida 1995. Taxonomic notes on some species of the family Clusiaceae. *J. Eco. Tax. Bot.* 19:473-476.
- Singh, N.P. 1993. Family *Clusiaceae*. In: B.D. Sharma and M. Sanjappa (ed.). *Flora of India*. vol. 3. Botanical Survey of India, Calcutta. p. 120.

## 73. GLORIOSA SUPERBA L. ( Liliaceae )

### Nomenclature

*Gloriosa superba* L., Sp. Pl. 305. 1753; Wt., Ic. Pl. Ind. Orient. t. 2047. 1853; Hook.f. in Hook.f., Fl. Brit. India 6: 358. 1892; Rama Rao, Fl. Pl. Trav. 415. 1914; Gamble, Fl. Presid. Madras 3: 1519. 1928; Nicol. *et al.*, Intrap. Hort. Malab. 295. 1988.

### Local name(s)

Menthoni, Mettonni, Ventorii.

### Description

**Climbing herbs**, upto 6 m high; **rootstock** 12-30 cm long, solid, fleshy, white, upto 4 cm in diameter, cylindric, bifurcately branched or V-shaped, with fibrous roots. **Leaves** simple, sessile, ternately whorled, scattered or subopposite, 8-13 x 1.5-3.5 cm, ovate-lanceolate, cordate at base, acuminate

and prolonged as tendril at apex. **Flowers** scarlet or crimson when mature. axillary and solitary or in terminal corymbose inflorescence; **pedicels** 7-13 cm long with deflexed apex; **perianth** of 6 segments, greenish, yellow or orange as they mature, upto 6 x 1.5 cm, linear-lanceolate with crisply waved margins; **stamens** 6 with filaments 2-5 cm long, spreading and anthers upto 1.3 cm long, linear, dorsifixed and versatile; **pistil** with 3-loculed ovary and numerous ovules in each locule, style upto 5 cm long, filiform, deflexed and stigmatose within. **Capsules** upto 4 x 1.5 cm, linear-oblong, septicial; **seeds** subglobose with spongy, wing-like testa (Fig. 25).



Fig. 25. *Gloriosa superba* L.

**Ecology**

Leaf-tendril climbers in the forest floor especially along hedges in open areas, stream banks, plains, slopes and outskirts of dry and moist deciduous forests. Showy flowers are produced during July to September and fruits mature by October-November. The changing flower colour of the species sometimes confuses the identity of the plant in the field.

**Distribution**

Kerala

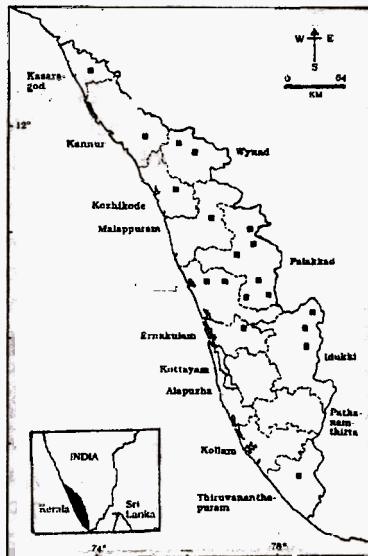
Kasaragod, Cannanore, Wynad, Calicut, Malappuram, Palghat, Trichur, Ernakulam, Idukki and Trivandrum districts; almost throughout the State, mainly in the mid and hilly uplands (Map 73).

World

Tropical and South Africa, India, Indonesia, Malesia.

**Products and uses**

Tubers of the plant are extracted, mostly during rainy season or immediately after the rains, for medicinal use,



Map 73 Distribution of *Gloriosa superba* L. in Kerala.

which are dried and stored. It is mainly employed in drug preparations to cure colic, chronic ulcers and piles. Externally, a paste of the tuber is applied to cure skin diseases. The drug property of the product is mainly attributed to the alkaloid Colchicine (Anonymous, 1956) which is also used in the treatment of gout and rheumatism. In large doses, the drug is poisonous. In biotechnology, Colchicine is a highly reputed chemical for inducing polyploidy in plants, much desired for genetic manipulations and also productivity improvement. This species of high medicinal value and biotechnological applications, common in the forests of Kerala, has not been included in the work of Krishnamurthy (1993).

### References cited

- Anonymous, 1956. *The Wealth of India: Raw Materials*. vol. 4. CSIR, New Delhi. pp. 139-140.
- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi.

## 74. GMELINA ARBOREA ROXB. ( Verbenaceae )

### Nomenclature

*Gmelina arborea* Roxb., (Hort. Beng. 46. 1814, *nom. nud.*) Pl. Corom. t. 246. 1815; Wt., Ic Pl. Ind. Orient. t. 1470. 1849; Bedd., Fl. Sylvat. South. India t. 253. 1872; Clarke in Hook.f., Fl. Brit. India 4: 581. 1885; Bourd., For. Trees Trav. 254. 1908; Rama Rao, Fl. Pl. Trav. 316. 1914; Gamble, Fl. Presid. Madras 2: 1097. 1924; Nicol. *et al.*, Intrap. Hort. Malab. 261. 1988; Krishnam., Min. For. Prod. India 205, 419, 478. 1993.

*Gmelina rheedii* Hook., Bot. Mag. 74: t. 4395. 1848 (*nom. illeg.*).

### Local name(s)

Kumala; Kumbil, Kumilu.

### Description

**Trees**, 10-15m high; **branchlets** fine-white-mealy pubescent. **Leaves** simple, opposite, 4-18 x 3.5-14 cm, ovate, entire, glabrous above when mature, stellately fulvous-tomentose beneath, cordate, truncate or cuneate at base, acuminate at apex; **petioles** 4-7 cm long, cylindric, puberulous, glandular at apex. **Flowers** brownish-yellow in fulvous-tomentose, axillary panicles of 1-3 flowered cymes; **pedicels** 2-7 cm long; **calyx** upto 0.5 cm long, campanulate, fulvous-tomentose, obscurely 5-triangular teethed; **corolla** tubular, upto 3.5 cm long, pubescent, 5-lobed and 2-lipped, obliquely funnel shaped at throat; **stamens** 4, didymous, upto 1.7 cm long, inserted below the throat of the



corolla tube with anthers upto 0.2 cm long; **pistil** upto 2 cm long, with 4-loculed, pubescent ovary, slender style and shortly bifid stigma. **Drupes** orange-yellow, upto 2.5 x 1 cm, ovoid or pyriform, smooth; **seeds** solitary, oblong.

### Ecology

Medium sized, deciduous trees, rather common in open, moist and dry deciduous forest areas; also grown as forest plantations. The trees flower during March-April and fruits mature by November-December.

### Distribution

#### Kerala

Cannanore, Wynad, Malappuram, Palghat, Trichur, Ernakulam, Idukki, Pathanamthitta, Quilon and Trivandrum districts; almost throughout the State, mainly in the mid and hilly uplands (Map 749).

#### World

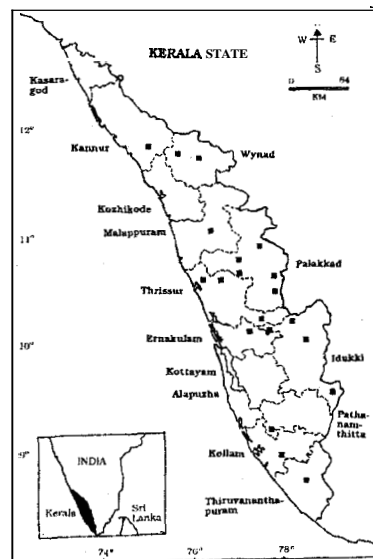
India, Pakistan, Bhutan, Sri Lanka, Myanmar, Indo-China, Malesia, Indonesia, South China, South America. Thailand.

### Products and uses

Roots which form an ingredient in the ayurvedic drug combination 'Dasamoola' (ten roots) is the major product of medicinal use. extracted from this tree. The root finds its use in the preparation of a large number of ayurvedic medicines. Bark, leaves, flowers and fruits of the tree are also extracted for medicinal purposes. The soft timber of the tree is extensively used for the making of musical instruments, shafts, axles, lacquered boxes, picture frames, stethoscopes, artificial limbs, jute bobbins, loom parts, callipers, mine-props, etc. Apart from construction work, the timber is also used for making paper, match sticks and match boxes. Krishnamurthy (1993) reports that the fleshy fruits of the tree are edible and leaves and twigs make fodder.

### Production and marketing

The roots of the plant are extracted from the natural forests of the State, which after drying, is sold to the Kerala State SC & ST Federation (1998) as a medicinal product. During 1994-95 to 1996-97, about 1306 kg of the



Map 74. Distribution of *Gmelina arborea* Roxb. in Kerala.

material was handled by the Federation at a cost of around Rs. 5.00 per kilogram.

### Regeneration

This is a light demanding species, though the tree survives well in partial shade also. It is moderately frost-hardy but draught-sensitive which affects its growth pattern. The plant coppices well and also produces root-suckers. However, young saplings are often browsed by cattle and deer. Seed germination is reported to be adversely affected by shade and also exposed soil conditions. In suitable forest conditions, the tree regenerates well from seeds.

For artificial regeneration of *G. arborea*, either planting of nursery raised seedlings or direct sowing of seeds are in practice. Fruits ripen during May to June and about 3600 seeds weigh one kilogram. On storage, the seeds slowly lose viability and for fresh seeds, germination is upto 90 percent. Seeds may be sown in drills in the nursery, shortly before the rainy season, and the nursery beds need not be shaded. Watering and weeding is essential and germination will start by 10-15 days. The seedlings can be field-planted either in the same rainy season or after a year. Trimming of the shoot and root portions of one-year old seedlings is recommended (Troup, 1921) before planting in the field. Direct sowing of seeds in lines is also usually done for the artificial regeneration of the species (Kadambi and Dabral, 1955)

### References cited

- Kadambi, K. and S.N. Dabral 1955. Studies on the suitability of different methods of artificially regenerating forest species. *Indian For.* 81: 125-159.
- Kerala State SC & ST Federation 1998. Different items of LFPP handled during 1994-95 to 1996-97 and price fixed by MFP Committee per kilogram for 1997-98. Trivandrum (unpublished).
- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi. pp. 205, 478.
- Troup, R.S. 1921. *Silviculture of Indian Trees*. vol. 2. Clarendon Press, Oxford. pp. 769-776.

## 75. GYMNEMA SYLVESTRE (RETZ.) R.BR. EX SCHULT. (Asclepiadaceae)

### Nomenclature

*Gymnema sylvestre* (Retz.) R.Br. ex Schult. in Roem. et Schult., Syst. Veg. 6: 57. 1820; Wt., Ic. Pl. Ind. Orient. t. 349. 1840; Hook.f. in Hook.f., Fl. Brit. India 4: 29. 1883; Rama Rao, Fl. Pl. Trav. 262. 1914; Gamble, Fl. Presid. Madras 2: 838. 1923; Sant. et Irani, Univ. Bombay Bot. Mem. No. 4: 47. 1960; Krishnam., Min. For. Prod. India 62-63. 1993.

*Periploca sylvestre* Retz., Obs. 2: 15. 1781

### Local name(s)

Chakkara-kolli. Sharkara-kolli.

### Description

Shrubby **climbers**, 1.5-3m high; **branchlets** terete, pubescent, spreading. **Leaves** simple, opposite, 3-5.5 x 1-2 cm, ovate, elliptic or ovate-lanceolate, pubescent on both sides, more so along the nerves beneath, obtuse, truncate or shallowly cordate at base, acute or shortly acuminate at apex; **petioles** 0.5-1.2 cm long, pubescent. **Flowers** yellow in umbel-like, axillary cymes, shorter than the leaves; **pedicels** upto 1.2cm long, pubescent; **calyx** upto 0.2 cm long, pubescent, segmented; **corolla** upto 0.2 cm long, campanulate with ovate-deltoid, thick, recurved, spreading lobes; **corona** of 5 fleshy processes, inserted alternately to the petals on the corolla tube, with ciliate margins; **pistil** with thick, subhemispherical style apex, exserted beyond the anthers. **Merocarps** 5-6.5 cm across, terete, rigid, lanceolate, attenuate at apex forming a beak; **seeds** almost 1 cm long, narrowly ovoid-oblong, flat with marginal wing.

### Ecology

Fairly common along the margins of semi-evergreen forests, in forest openings and along hedges, especially in lateritic areas. This climber flowers during September to November and by December-January fruits mature.

### Distribution

#### Kerala

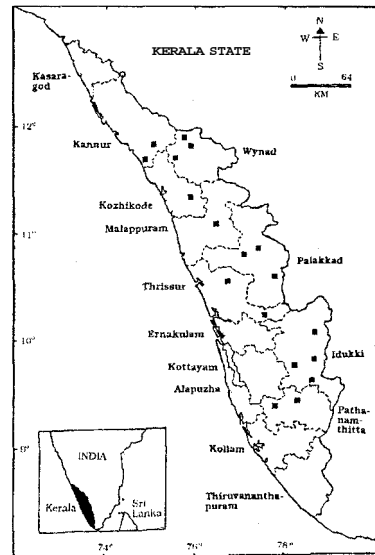
Cannanore, Wynad, Calicut, Malappuram, Palghat, Trichur, Idukki and Pathanamthitta districts; almost throughout the State (Map 75).

#### World

Peninsular India, Sri Lanka, tropical Africa.

### Products and uses

The plant as such or its leaves are extracted for medicinal purposes. It is remedial for stomach ache, cough, biliousness, sore-eyes, etc. and is a laxative, diuretic, heart stimulant, and



Map 75. Distribution of *Gymnema sylvestre* (Retz.) R. Br. ex Schult. in Kerala.

so on. The roots are reported

(Krishnamurthy, 1993) to be used by the local people against diabetes. This may be because the leaves of the plant when chewed neutralises the sweetness and bitterness; but this reaction is not directly connected to blood-sugar content. It has been recorded that (Anonymous, 1956) the anti-sugar effect is due to the creation of hypoglycaemia in the animals experimented, the effect being due to increased insulin secretion by the pancreas. It is the gymnemic acid in the leaves of this plant which nullify the sense of sweatness and bitterness.

### References cited

- Anonymous, 1956. *The Wealth of India: Raw Materials*. vol. 4. CSIR, New Delhi. p. 276.
- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi. p. 62.

## 76. HELICTERES ISORA L. ( Sterculiaceae )

### Nomenclature

*Helicteres isora* L., Sp. Pl. 963. 1753; Wt. *et* Arn., Prodr. 60. 1834; Wt., Ic. Pl. Ind. Orient. t. 180. 1839; Mast. in Hook. f., Fl. Brit. India 1: 365. 1874; Rama Rao, Fl. Pl. Trav. 48. 1914; Dunn in Gamble, Fl. Presid. Madras 1: 107. 1915; Nicol. *et al.*, Intrap. Hort. Malab. 253. 1988; Krishnam., Min. For. Prod. India 388, 479. 1993.

### Local name(s)

Edampiri-valampiri.

### Description

**Shrubs**, 2-3 m high; **branchlets** stiff, stellate-hairy. **Leaves** simple, bifarious, 5.5-13 x 4-10 cm, oblong, ovate or rounded, serrate, stellate-hairy on both surfaces, cordate, subcordate or rounded at base, abruptly shortly acuminate at apex; **petioles** 0.5-1 cm long, slender, stellate-hairy. **Flowers** lilac or red, in axillary clusters of 2-6, distinctly bilabiate; **pedicels** upto 1 cm long, stellate-tomentose; **calyx** upto 1.5 cm long, tubular, 2-lipped, curved, unequally triangular-teethed from a wide



Fig. 26. *Helicteres isora* L.

mouth; **corolla** 3-3.5 cm long, red fading to lead colour, unequally lobed, closely reflexed; **stamens** 10, united into a staminal column with the gynophore, exserted, abruptly deflexed with 10 anthers forming a ring around the ovary; **pistil** upto 3.5 cm long, on a curved gynophore with deflexed style almost as long as the 5-lobed, 5-loculed ovary. **Follicles** 5-6.5 cm long, linear, twisted, beaked, stellate-tomentose; **seeds** numerous, angular, wrinkled (Fig. 26).

### Ecology

Shrubs, common in the moist and dry deciduous forests tracts, especially in disturbed, open or degraded areas, forest boundaries, valleys and such areas. Fruits of this plant is quite characteristic of the species and hence the local name. Flame-coloured flowers are produced during September to November and fruits ripen during March to May.

### Distribution

#### Kerala

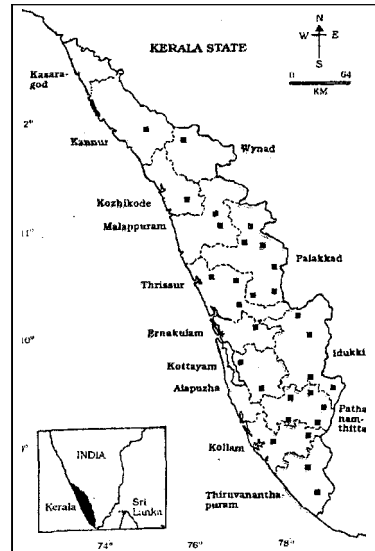
Cannanore, Wynad, Calicut, Malappuram, Palghat, Trichur, Emakulam, Idukki, Kottayam, Pathanamthitta, Quilon and Trivandrum districts; almost throughout the State, mostly in the mid and hilly uplands (Map 76).

#### World

India, Sri Lanka, Myanmar, Malesia, Australia, West Indies.

### Products and uses

Roots, stems and fruits of the plant are exploited for medicinal purposes. The stem-bark is also exploited for fibre. The fibre is extracted by retting the stem in water and removing the fibre which is light brown to greyish green in colour, durable, silky and lustrous. However, the fibre is inferior to jute in strength (Krishnamurthy, 1993) and is used for making cordages, bags, fancy items, canvas, etc. Stalks and twigs of the plant, with or without bark, are also suitable for the manufacture of writing or printing paper, in combination with long-fibre pulp of bamboo species. This is because the pulp of *Helicteres isora* is short fibred (Krishnamurthy, 1993).



Map 76. Distribution of *Helicteres isora* L. in Kerala

### Production and marketing

The total turn-over of the dried fruits of the plant was about 1109 kg during 1994-95 to 1996-97, as recorded by the Kerala State SC & ST Federation (1998). The cost of the item was around Rs. 1.50 per kilogram during the period. Certain quantity of the item collected from forest areas might have also gone to the general market, on which there is no quantified data available.

### Regeneration

*H. isora* is a shade tolerant shrub which can thrive well in both fertile and also dry, rocky soils. The plant regenerates well by coppices, especially when affected by fire. Regeneration of the species by seed dispersal is also quite common in natural conditions.

The plant can be artificially regenerated from seeds. Fruits disperse during April to June and about 620 dried seeds weigh one kilogram (FRI, 1981). The seeds sown during rainy season will germinate and grow without much care or other inputs.

### References cited

- FRI, 1981. *Troup's Silviculture of Indian Trees*. vol . 3. Controller of Publications, Delhi. pp. 36-38.
- Kerala State SC & ST Federation 1998. Different items of LFPP handled during 1994-95 to 1996-97 and price fixed by MFP Committee per kilogram for 1997-98. Trivandrum (unpublished).
- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi. p. 388.

## 77. HEMIDESMUS INDICUS (L.) R. BR. ( Periplocaceae )

### Nomenclature

*Hemidesmus indicus* (L.) R. Br., Mem. Wern. Nat. Hist. Soc. 1: 56. 1809; Wt. *et* Arn., Contrib. Ind. Bot. 63. 1834; Wt., Ic. Pl. Ind. Orient. t. 594. 1842; Hook.f. in Hook.f., Fl. Brit. India 4: 4. 1883; Rama Rao, Fl. Pl. Trav. 258. 1914; Gamble, Fl. Presid. Madras 2: 825. 1923; Sant. *et* Irani, Univ. Bombay Bot. Mem. 4: 96. 1962; Nicol. *etal.*, Intrap. Hort. Malab. 62. 1988; Krishnam., Min. For. Prod. India 63. 1993.

*Periploca indica* L., Sp. P1.211. 1753.

### Local

Nannari, Naru-neenti.

## Description

Twining, herbaceous **climbers**, upto 3 m high; **roots** tuberous; **branches** slender, terete, glabrous, slightly thickened at nodes. **Leaves** simple, decussate or rarely whorled, 3-6.5 x 1-3 cm, very variable in shape from elliptic-oblong to linear-lanceolate, glabrous, frequently variegated with white along the nerves, acute, rounded or truncate at base, acute, obtuse or emarginate and apiculate at apex; **petioles** upto 0.5 cm long, slender. **Flowers** greenish-white, crowded in short, axillary subsessile cymes; **pedicels** upto 0.5 cm long, covered with bracts; **calyx** upto 0.3 cm long, ovate, acute, 5-lobed; **corolla** 0.5-0.7 cm long, shortly tubular, purplish inside with 5 ovate-oblong, acuminate lobes; **stamens** 5, inserted at the base of the corolla tube and filaments connivent around the styles with anthers coherent at apex; **pistil** with 5-angled style apex. **Merocarps** 10-12cm long, slender, striate, glabrous, tapering towards apex; **seeds** black, 0.4-0.8 cm long, ovate-oblong with silvery white coma at apex.

## Ecology

Slender, climbing herbs with dark brown, wiry stem and tuberous roots. Rather common along hedges and forest boundaries, open, bushy areas, grassy slopes, etc. of moist and dry deciduous forest tracts. Flowers during September-October and fruits ripen by December-January.

## Distribution

### Kerala

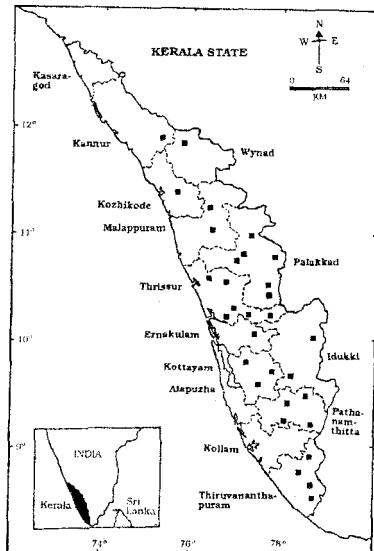
Cannanore, Wynad, Calicut, Malappuram, Palghat, Trichur, Ernakulam, Idukki, Kottayam, Pathanamthitta, Quilon and Trivandrum districts; almost throughout the State, mainly in the mid and hilly uplands (Map 77).

### World

Peninsular India extending to Bihar and Orissa. Sri Lanka.

## Products and uses

This is the Indian Sarasaparilla plant, a substitute of the true sarasaparilla (*Smilax zeylanica* L.). The aromatic, tuberous roots are extracted for the preparation of tonic, alterative, demulcent, diaphoretic, aleuretic and blood purifier (Krishnamurthy, 1993). The



Map 77. Distribution of *Hemidesmus indicus* (L.) R. Br. in Kerala.

roots are also used in the treatment of venereal diseases, rheumatism, urinary disorders and skin diseases. The stem-latex of the plant is a curative for eye inflammation. The root syrup is also a flavouring agent used in the preparation of soft drinks. The stem of the plant yields fibre and is also used as such like rope or for weaving baskets.

### Production and marketing

The root extract of the plant, known as Indian Sarassaparila in trade, is often a mixture of that of *H. indicus* and *Smilax zeylanica* (Shiva, *et al.* 1996). However, the Kerala State SC & ST Federation (1998) received about 756 kg of the aromatic root at a cost of Rs. 47.50 per kg which was sold at the rate of Rs. 50 per kilogram. The product was also exported from India to the tune of 3.25 tonnes during 1990-91, worth Rs. 85000.00 (Shiva, *et al.*, 1996). A large quantity of the product is also consumed domestically in medicine and food preparations, of which there is no quantified data available.

### References cited

- Kerala State SC & ST Federation 1998 Different items of LFPP handled during 1994-95 to 1996-97 and price fixed by MFP Committee per kilogram for 1997-98 Trivandrum (unpublished)
- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi. p. 63.
- Shiva, M.P., S. Aswal, A. Sharma, P. Mathur and R. Chandra 1996. *Trends of Export and Import of the Minor Forest Products in India*. Centre for Minor Forest Products, Dehra Dun. 38 p.

## 78. HERACLEUM RINGENS WALL. EX DC. (Umbelliferae)

### Nomenclature

*Heracleum ringens* Wall. ex DC., Prodr. 4: 191. 1830; Clarke in Hook. f., Fl. Brit. India 2: 715. 1879; Rama Rao, Fl. Pl. Trav. 197. 1914; Gamble, Fl. Presid. Madras 1: 565. 1919.  
*Pastinaca ringens* (Wall. ex DC.) Wt., Ic. Pl. Ind. Orient. t. 1009. 1845.

### Local name(s)

Chittelam.

### Description

Perennial, erect **herbs**, upto 1.5 m high, grey pubescent towards apex. **Leaves** alternate, radical and cauline, compound, 7-12 cm long, 1-3 pinnate, segments lobed or toothed with a terminal 3-lobed segment larger in size; **leaflets** 3 pairs, 2-3 x 2.5 - 3.5 cm, chartaceous, glandular-pubescent, serrate-



denticulate, subcordate-obtuse at base, rounded at apex. **petioles** 4-8 cm long, sheathing at base. **Flowers** yellow in compound, pedunculate umbels, 4-5 cm long, with involucre bracts absent or simple and foliaceous and many bracteoles; **calyx** 5-lobed, adnate to the ovary, linear-lanceolate or triangular lobed or lobes absent; **corolla** with 5, almost equal, often radiant, lanceolate lobes, incurved and bifid or emarginate at apex; **stamens** 5, epigynous, alternate with filaments upto 0.2 cm long; **pistil** with inferior, 2-loculed ovary, pubescent and crowned by the disc at apex and two dilated styles and capitate stigmas; **Fruits** of 2, elliptic-ovate, thick on the back, dorsally compressed, winged, ridged mericarps; **seeds** one in each mericarp, dorsally compressed and plano-convex.

### Ecology

Habituated to grassy slopes and along fringes of shola forests at higher altitudes; the plants flower and fruit during November to February. The roots of the plant is quite robust.

### Distribution

Kerala

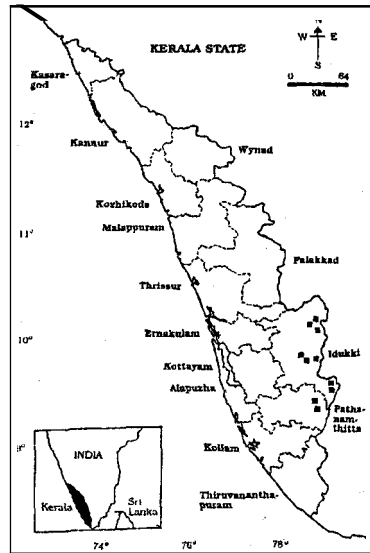
Palghat, Idukki and Pathanamthitta Districts (Map 78).

World

Peninsular India, Sri Lanka.

### Products and uses

From roots of the plant, six coumarins have been isolated, namely Heraclenin, Isopimpinellin, Osthol, Imperatorin, Bergapten and Isobergapten (Atal and Kapur, 1982). Both seeds and rhizomes of the plant are medicinal as expectorant and sedative and are also used in the treatment of rheumatism and breathing troubles (Pushpangadan and Nair, 1997). Sometimes, the source of the product is mentioned as *Heracleum candolleianum* Gamble, a taxon formerly considered as a variety of *H. ringens*.



Map 78. Distribution of *Heracleum ringens* Wall. ex DC. in Kerala.

### Production and marketing

This non-wood forest produce from the State forests is available only from the high altitude areas and is gathered and sold to the Kerala State SC & ST Federation (1998) at the rate of Rs. 47.50 per kg which was disposed off for Rs.50.00 per kilogram by the Federation. As noted from the Federation (1998)

records, only very small quantity of the item was received by them during 1994-95 to 1996-97 and there is information available as to whether the product is also marketed in the open.

### References cited

- Atal, C.K. and B.M. Kapur 1982. *Cultivation and Utilization of Medicinal Plants*. RRI, CSIR, Jammu Tawi. p. 310.
- Kerala State SC & ST Federation 1998. Different items of LFPP handed during 1994-95 to 1996-97 and price fixed by MFP Committee per kilogram for 1997-98. Trivandrum (unpublished).
- Puspangadan, P. and K.N. Nair 1997. *The Natural Resources of Kerala*. World Wide Fund, Trivandrum. p. 322.

## 79. HOLARRHENA PUBESCENS (BUCH.-HAM.) WALL. EX G. DON ( Apocynaceae )

### Nomenclature

- Holarrhena pubescens* (Buch.-Ham.) Wall. ex G. Don, Gen. Syst. 4: 78. 1838; Panigrahi, Taxon 36(2): 466. 1987; Nicol. *et al.*, Intrap. Hort. Malab. 55. 1988.
- Echites pubescens* Buch.-Ham., Trans. Linn. Soc. London 13: 524. 1822.
- Chonemorpha antidysenterica* (Roth) G. Don, Gen. Syst. 4: 76. 1837-38; Wt., Ic. Pl. Ind. Orient. t. 439. 1840-43.
- Holarrhena antidysenterica* (Roth) A. DC., Prodr. 8: 413. 1844; Bedd., Fl. Sylvat. South. India t. 6. 1869; Hook.f.in. Hook.f., Fl. Brit. India 3: 644. 1882; (*non* (L.) Wall.); Bourd., For. Trees Trav. 234. 1908; Rama Rao, Fl. Pl. Trav. 254. 1914; Gamble, Fl. Presid. Madras 2: 811. 1923; Krishnam., Min. For. Prod. India 64,297,398. 1993.
- Echites antidysenterica* Roth in Roem. *et* Schult., Syst. Veg. 4: 394. 1819 (*non* (L.) Roxb. *ex* Fleming, 1810); Wt., Ic. Pl. Ind. Orient. t. 1297-98. 1848.

### Local name(s)

Kodakappala.

### Description

Stunted **trees**, upto 15 m high; **branchlets** glabrous or slightly pubescent. **Leaves** simple, opposite or subopposite, 6.5-15 x 4-9 cm, ovate-lanceolate to lanceolate, entire, almost glabrous with few lateral nerves strongly arched, obtuse at base, obtuse or obtusely acuminate at apex; **petioles** obscure or upto 0.4 cm long, glabrous. **Flowers** white in shortly pedunculate axillary and terminal panicles of corymbose cymes; **calyx** 5-lobed, lobes upto 0.3 cm long, oblong-lanceolate or linear, acute at apex, glandular hairy within; **corolla** tubular, 1.5 cm long, slightly inflated at the base, puberulous outside,

hairy at the throat, with linear, obtuse lobes overlapping to the left in bud and upto 1 cm long; **stamens** upto 0.2 cm long, included in the corolla tube and inserted at the base, with short filaments and ovoid-oblong, apiculate anthers rounded at base; **pis-til** two, with many ovules in each ovary, short and filiform style and thickened, oblong stigma. **Merocarps** 10-20cm long, slender, cylindrical, incurved, dehiscent along the ventral suture; **seeds** dark brown, upto 1 cm long, linear, compressed, tufted hairy at tip (Fig. 27).



Fig. 27. *Holarrhena nubescens* (Buch.-Ham.) Wall. ex G. Don

**Ecology**

Attractive shrubs or small trees with milky-white flowers produced in large clusters. The stem and midrib of leaves are brown. Rather common on rocky hill tops, open areas, forest plantations and slopes and boundaries of deciduous forests. The plant is in flower during June to September and by February-March, fruits mature.

**Distribution**

Kerala

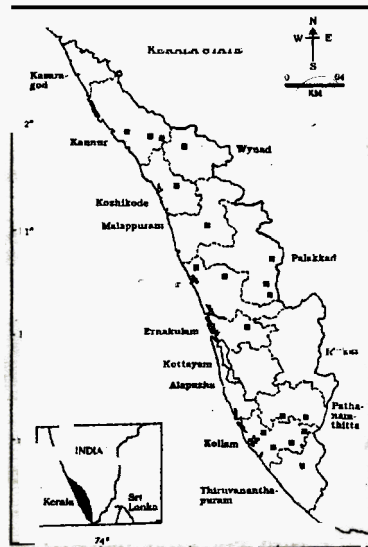
Cannanore, Wynad, Calicut, Malappuram, Palghat, Trichur, Ernakulam, Pathanamthitta, Quilon and Trivandrum districts; almost throughout the State (Map 79).

World

Southern Asia and Eastern and South-em Africa.

**Products and uses**

The stem and root bark of the tree are medicinal, and therefore extracted on a large scale. The leaves of the plant are also used against chronic bronchitis and are also the source of adye, similar to Indigo. A decoction of the seeds mixed with honey is curative for diarrhoea and dysentery. Krishnamurthy (1993) had also reported that the leaves and bark of the plant are also used



Map 79 Distribution of *Holarrhena nubescens* (Buch Ham) Wall ex G Don in Kerala

locally to check dysentery and bark and seeds as blood purifier. The seeds yield 19-30% of an oil, greenish-yellow in colour with penetrating odour, used locally as an anthelmintic. The fruits yield floss useful for stuffing purposes. The soft wood of this tree is also used for carving, making toys and for turning.

### Regeneration

The tree is draught hardy but sensitive to frost and shade. It coppices well and produces root suckers also. Copious seed production facilitates regeneration of the plant in natural conditions, even though seeds are often damaged by draught and frost conditions.

For artificial regeneration of the tree, seeds can be collected from natural stands during February to April, before the fruits open and seeds get wind dispersed. The sun-dried seeds record high percentage of germination when fresh, and on storage, they lose viability gradually and often within one year of storage, the seeds become almost dead. About 33000-39000 seeds weigh one kilogram and germination percentage is about 62-84, with a plant percent of around 55. It takes only 4-15 days for the seeds to germinate (FRI, 1985). Direct sowing of seeds, planting out nursery-raised seedlings and stump-planting methods are used to regenerate the species. To raise nursery seedlings, seeds can be collected, sun-dried and sown in the nursery during March-April and by the next rainy season they can be field-planted. In the case of stump-planting, 23 cm root and 7-8 cm shoot stumps are reported to have 84% survival (FRI, 1985) when field planted.

### References cited

- FRI. 1985. *Troup's Silviculture of Indian Trees*. vol. 6. Controller of Publications, Delhi. pp. 153-157.
- Knshnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi. pp. 64, 297, 398.

## 80. HOLOSTEMMA ANNULARE (ROXB.) SCHUM. (Asclepiadaceae)

### Nomenclature

- Holostemma annulare* (Roxb.) Schum. in Engl. *et* Prantl, Pflanzenfam. 4 (2): 250. 1895 (as *annularis*); Nicol. *et al.*, Intrap. Hort. Malab. 63. 1988; Krishnam., Min. For. Prod. India 207. 1993.
- Asclepias annularis* Roxb., Hort. Beng. 20. 1814 (as *annularia*); Gamble, Fl. Presid. Madras 2: 834. 1924.
- Holostemma ada-kodien* R.Br. *ex* Schult., Syst. Veg. 6: 95. 1820.
- Holostemma rheedianum* Spreng., Syst. Veg. I: 851. 1825.

*Holostemma rheedii* Wall., (Cat. No. 4409. 1828 *nom. nud.*) Pl. As. Rar. 2: 51. 1831; Wt., 1c. Pl. Ind. Orient. t. 597. 2843; Hook. f. in Hook. f., Fl. Brit. India 4: 21. 1883; Rama Rao, Fl. Pl. Trav. 261. 1914.

*Sarcostemma annulare* Roth, Nov. Pl. Ind. Orient. 178. 1821.

### Local name(s)

Ada-kodian, Adapathiyan.

### Description

**Shrubs**, twining and climbing, upto 4 m high; **stem** much branched, glabrous. **Leaves** simple, opposite, 4-6 x 2-3.5 cm, ovate-oblong or cordiform, thick, entire, glabrous above, pubescent beneath especially along the nerves, deeply cordate and lobed at base, obtusely acute or acuminate at apex; **petioles** 2-5.5 cm long, stout, glabrous. **Flowers** purple, fragrant, in sublateral, lax, pedunculate, few-flowered cymes; **pedicels** upto 1.5 cm long, stout, glabrous; **calyx** 5-partite, with lobes upto 0.4 x 0.3 cm, ovate, ciliate along margins and subacute at apex; **corolla** upto 1.5 cm across, purplish-pink outside, pale-pink inside, deeply (2/3) divided with lobes overlapping to the right; **stamens** in a column arising from the base of the corolla tube with stiff wings and membranous tips inflexed over the column, and pendulous pollinia narrowed towards the short caudicle; **pistil** with subglobose ovary, upto 0.4 cm long style and conical, 5 or 10 angled stigma. **Follicles** upto 12 cm long, linear-oblong, cylindrical, tapering towards apex; **seeds** almost 0.5 cm long, oblong, flattened with coma upto 2 cm long.

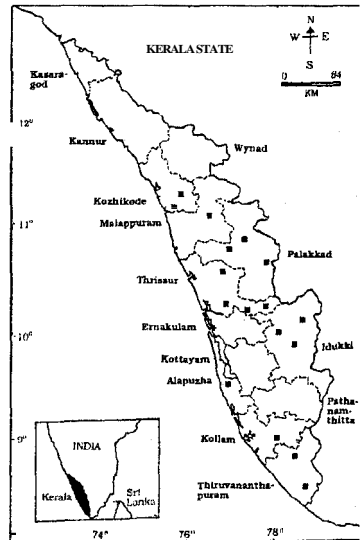
### Ecology

Plants with underground stem producing aerial leaves and inflorescence. The species is rather rare in Kerala where it grows in plains, open forest gaps, along roadsides and in younger forest plantations like that of teak. Leaves and flowers are produced during July-August and fruits mature during November-December.

### Distribution

Kerala

Calicut, Malappuram, Palghat, Trichur, Munnar, Idukki, Alleppy, Quilon and Trivandrum districts; almost throughout the State (Map 80).



Map 80. Distribution of *Holostemma annulare* (Roxb.) Schum. in Kerala.

**World**

Tropical Himalayas to Peninsular India, Sri Lanka, Myanmar, West China.

**Products and uses**

It is mainly the medicinal roots of the plant, which are extracted on a large scale, even though leaves, flowers and also the stem are useful. The roots possess cooling, alterative, tonic and laxative properties and a paste of it is advocated for ophthalmia and orchitis. The roots are also anti-diabetic. The leaves, flowers and fruits of the plant are useful as vegetable (Anonymous, 1959) and the fibrous bark of the stem makes cordage and also paper pulp (Viswanathan, *et al.*, 1981).

**Production and marketing**

During 1994-95 to 1996-97, the Kerala State SC & ST Federation (1998) handled about 300 kg of the dried tubers of *H. adkodian*. The purchase rate of the Federation for the item was Rs. 95.00 per kg and the selling price was fixed as Rs. 100.00 per kg during 1997-98.

**References cited**

- Anonymous, 1959. *The Wealth of India: Raw Materials*. vol. 5. CSIR, New Delhi. p. 111.
- Kerala State SC & ST Federation 1998. Different items of LFPP handled during 1994-95 to 1996-97 and price fixed by MFP Committee per kilogram for 1997-98. Trivandrum (unpublished).
- Viswanathan, M.V., K. Kashyap and K. Ramachandran. 1981. Less known fibre yielding plants of Peninsular India. *Bull. bot. Surv. India* 23: 240-242.

**81. HOPEA PARVIFLORA BEDD.  
( Dipterocarpaceae )**

**Nomenclature**

*Hopea parviflora* Bedd., Fl. Sylvat. South. Ind. 1: 308. 1874; Dyer in Hook.f., Fl. Brit. India 1: 308. 1874; Bourd., For. Trees Trav. 36. 1908; Rama Rao, Fl. Pl. Trav. 35. 1914; Dunn in Gamble, Fl. Presid. Madras 1: 82. 1915; Janardh. in Sharma *et* Sanjapp. (ed.) Fl. India 3: 228-229. fig. 59. 1993; Krishnam., Min. For. Prod. India 331. 1993.

**Local name(s)**

Irumbakam, Irupu, Kambakam, Thambakam.

**Description**

Evergreen **trees**, upto 40 m high, with dense crown; **trunk** upto 5 m in girth, straight, cylindrical; **bark** light brown or greyish, smooth when young, rough

and rusty-brown when old; **branchlets** reddish-brown, glaucacent. **Leaves** simple, alternate, 6-11 x 2.5-4 cm, ovate to oblong or ovate-lanceolate, entire, glabrous, acute or rounded at base, acute, apiculate or bluntly acuminate at apex. **Flowers** creamy-yellow, fragrant, shortly pedicelled in axillary or terminal lax panicles of unilateral racemes; **calyx** shortly tubular with ovate, glabrous lobes, the two outer ones obtuse and larger than the inner ones; **corolla** contorted with free imbricate petals, each upto 0.5 cm long, ovate-lanceolate or falcate-oblong, pubescent externally; **stamens** 10 or 15 with subulate filaments, connate at base, outer ones longer and short, medifixed anthers with filiform appendages; **pistil** with 3-locular, puberulous ovary, short, cylindrical style and thick stigma. **Fruits** straw-coloured, nut-like, about 1 cm long, ovoid, apiculate, enclosed in the calyx lobes, 2-winged, 1-seeded.

**Ecology**

Graceful trees, often forming pure patches especially in evergreen and semi-evergreen forests of more hygrophilous character, upto an elevation of 1000 m in Kerala. When the habitat is suitable, regeneration of the species is also very good. Flowers are produced during January to June and fruits mature by April-May, facilitating wind dispersal during the summer season.

**Distribution**

**Kerala**

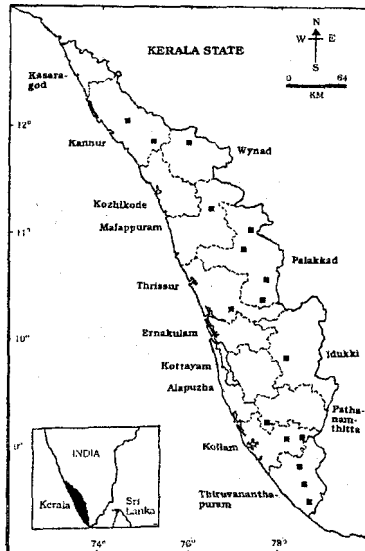
Cannanore, Wynad, Malappuram, Palghat, Trichur, Idukki, Pathanamthitta, Quilon and Trivandrum districts; almost throughout the State, rarely in midlands and more commonly in hilly uplands and highlands (Map 81).

**World**

Southern Peninsular India (endemic) in the Western Ghats of Kerala, Karnataka and Tamil Nadu.

**Products and uses**

Bark yields tannin used to cure especially heavy quality leather (Janardhanan, 1993). The tannin content ranges from 14-28% of the exudate and is very astringent with a slow rate of diffusion. Therefore, as reported by Krishnamurthy, (1993), it has to be used along with other tanning materials like myrobalan or wattle to give satisfactory results.



Map 81. Distribution of *Hopea parviflora* Beed. in Kerala.

## Regeneration

Natural regeneration of the tree is by seeds. The seeds lose their viability within a few days after dispersal. Even though seedlings tolerate shade, when they attain sapling and pole stages, direct sunlight is essential for better survival and growth (Kadambi, 1954). Coppicing capacity of the tree is rather poor.

To artificially regenerate *H. parviflora*, seeds can be collected during April to June, which can be stored in gunny bags for less than 20 days. Within 40 days of storage, the seeds lose their viability completely (Luna, 1996). However, seeds, if collected about three weeks before ripening, will remain viable for more days, as they ripen during the storage period. One kilogram of fruits (with wings) contain about 2470 numbers and the plant percentage is about 1560 per kilogram of seeds germinated (Luna, 1996). Freshly collected seeds are to be sown in nursery beds with the wings placed flat on the ground and covered with soil. Germination starts within 10 days of sowing which will be completed in another 10 days. Percentage of germination of nursery sown seeds is about 68 and plant percent around 54 (FRI, 1980). The nursery beds are to be shaded and watered regularly and by the next planting season, the seedlings will attain a height of about 50 cm (Luna, 1996). One to two year old seedlings can be field planted, with or without a ball of earth covering the root portion. Direct sowing of seeds in suitable areas, cleared of undergrowth, is also practised to regenerate the species at a low cost. In such cases, weeding is essential for better survival and growth of the seedlings.

## References cited

- FRI, 1980. *Troup's Silviculture of Indian Trees*. vol. 2. Controller of Publications, Delhi. pp. 388-404.
- Janardhanan, K.P. 1993. Family Dipterocarpaceae. In: B.D. Sharma and M. Sanjappa (ed.) *Flora of India*. vol. 3. Botanical Survey of India, Calcutta. p. 230.
- Kadambi, K. 1954. *Hopea parviflora*: Its silviculture and management. *Indian For.* 80: 390-408.
- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi. p. 332.
- Luna, R. K. 1996. *Plantation Trees*. International Book Distributors, Dehra Dun. pp. 425-429.

## 82. HYDNOCARPUS PENTANDRUS (HAM.) OKEN ( Flacourtiaceae )

### Nomenclature

*Hydnocarpus pentandrus* (Ham.) Oken, *Allg. Naturgesch.* 3(2): 1381. 1841; Merr.,



J. Am. Arbor. 31: 279.1950; Mukh., Bull. bot. Surv. India 14: 183.1972; K.K.N Nair, J. Bombay nat. Hist. Soc. 80: 452-453. 1984; Nicol. *et al.*, Intrap. Hort. Malab. 147.1988.

*Chilmoria pentandra* Ham., Trans. Linn. Soc. London 13: 501. 1822.

*Munnicksia laurifolia* Dennst., Schluss. zum Hort. Malab. 13: 27. 1818.

*Hydnocarpus inebrians sensu (non Vahl) Wt. et Arn.*, Prodr. 30. 1834; Wt., 111. Ind. Bot. t. 16. 1840 & Ic. Pl. Ind. Orient. t. 942. 1844-45.

*Hydnocarpus wightiana* Bl., Rumph. 4: 22. 1848; Hook.f. *et* Thoms. in Hook.f., Fl. Brit. India Bourd., For. Trees Trav. 17. 1908; Rama Rao, Fl. Pl. Trav. 24. 1914; Dunn in Gamble, Fl. Presid. Madras 1: 52. 1915.

*Hydnocarpus laurifolia* (Dennst.) Sleurn. in Engl., Bot. Jahrb. 69: 33. 1939; Krishnam., Min. For. Prod. India 64, 297, 1993.

### Local name(s)

Kotti, Mara-vetti, Marotti, Neervalam, Neer-vetti.

### Description

**Trees** with buttressed trunk, 15-20 m high; **branchlets** twiggy, glabrous or brown-pubescent. **Leaves** simple, alternate, 8-20 x 4-7.5 cm, ovate, elliptic or lanceolate, entire or obscurely serrate, glabrous, thinly coriaceous, rounded or acute at base, acuminate at apex; **petioles** 0.5-1.5 cm long, thick. **Flowers** greenish yellow in solitary or few flowered, axillary cymes or fascicles, dioecious, upto 1 cm long; **calyx** of 5 sepals, 0.2-0.4 cm long, outer ones ovate-obtuse and the inner ones more concave, tomentose externally; **corolla** of 5 petals; 0.4-0.7 cm long, broadly-oblong or orbicular, fringed with soft, white hairs, rounded at apex, densely woolly hairy at base; **stamens** 5 in male flowers, opposite to petals, with subulate filaments hairy at base and oblong or reniform anthers; **staminodes** in female flowers 5, without anthers; **pistil** in female flowers with 1-loculed ovary, without style and stigmas flat on the top of the ovary, each cuneate and 2-lobed.



Fig. 28. *Hydnocarpus pentandra* (Ham.) Oken

**Berries** grey, tomentose when young, 4-6 cm across, globose with woody stalk; **seeds** dark grey, upto 1.5 cm long, obtusely angular, blunt at apex, covered with white pulp (Fig. 28).

## Ecology

Evergreen trees with buttressed trunk, often hollow inside, mostly common in wet habitats, growing along the sides of the ponds, streams and wet depressions in forest areas. The tree flowers during February-March or in July-August and fruits produced during October to December mature by March-April.

## Distribution

### Kerala

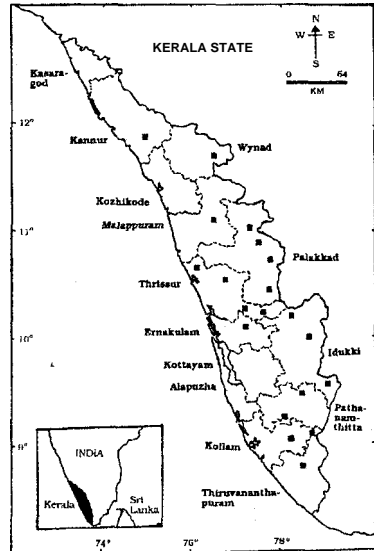
Cannanore, Wynad, Malappuram, Palghat, Trichur, Ernakulam, Idukki, Pathanamthitta, Quilon and Trivandrum districts; almost throughout the State (Map 82).

### World

South-West India.

## Notes

Nair (1984) had given a detailed discussion on the identity and nomenclature of the species and its differences from the Sri Lankan species *Hydnocarpus alpina* Wt.



Map 82. Distribution of *Hydnocarpus pentandrus* (Ham.) Oken in Kerala.

## Products and uses

Seeds of the tree yield the *Hydnocarpus* oil. The oil is extensively used in the preparation of medicines used to cure leprosy, chronic skin affections, rheumatism, sprains, ophthalmia, ulcers, bruises, etc. The kernels which weigh 60-70% of the seed weight yield 63.25% of oil (Krishnamurthy, 1993). The therapeutic property of the seed-oil is attributed to the compound Ethyl hydnocarpate present in the seeds of this plant. The oil is also used as an illuminant. Also the fruits of *H. pentandrus* are reported to be a fish poison (Anonymous, 1959).

## Production and marketing

Dried seeds of the tree are collected as an NWFP and marketed either in the open market or through the Kerala State SC & ST Federation (1998). The Federation handled about 2925 kg of the seeds during 1994-95 to 1996-97 at the rate of Rs. 23.75 per kg for procurement and Rs. 25.00 per kg for sale. A large quantity of the product is also coming from non-forest areas of the State which goes mostly into the open market through shops dealing with hill and agricultural produces.

## Regeneration

The tree is a moisture-lover and is sensitive to fire. In natural conditions, the seeds dispersed germinate during rains, as has been reported from Nilambur, Kerala State (FRI, 1975). To regenerate the species, fresh seeds available during March to April can be sun-dried and sown in the nursery. About 18-20 seeds will be available in an average size fruit and 700-900 seeds weigh one kilogram. Germination rate of the seeds is reported to be low (FRI, 1975). In the nursery, seeds are to be sown soon after collection. Germination can prolong to even for a year when sown in nursery beds and the final plant percent reported is only about 7. Direct dibbling of seeds is also practised to regenerate the tree and stump-planting is found to be not very successful. When the seedlings are transplanted, trimming of roots is harmful to their survival, even though pruning of stem is advantageous (FRI, 1975).

## References cited

- Anonymous, 1959. *The Wealth of India: Raw Materials*. vol. 5. CSIR, New Delhi. p. 142.
- FRI, 1975. *Troup's Silviculture of Indian Trees*. vol. 1. Controller of Publications, Delhi. pp. 189-193.
- Kerala State SC & ST Federation 1998. Different items of LFPP handled during 1994-95 to 1996-97 and price fixed by MFP Committee per kilogram for 1997-98. Trivandrum (unpublished).
- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi. p. 297.
- Nair, K.K.N. 1984. An interpretation of 'Marotti' plant in van Rheede's *Hortus Indicus Malabaricus*. *J. Bombay nat. Hist. Soc.* 80: 452-453.

## 83. ICHNOCARPUS FRUTESCENS (L.) R. Br. (Apocynaceae)

### Nomenclature

*Ichnocarpus frutescens* (L.) R. Br. in Aiton, Hort. Kew. ed. 2, 2: 69. 1811; Wt., Ic. Pl. Ind. Orient. t. 430. 1840-43; Hook.f. in Hook.f., Fl. Brit. India 3: 669. 1882; Rama Rao, Fl. P1. Trav. 258. 1914; Gamble, Fl. Presid. Madras 2: 820. 1923; Nicol. *et al.*, Intrp. Hort. Malab. 55. 1988; Krishnam., Min. For. Prod. India 389. 1993.

*Apocynum frutescens* L., Sp. Pl. 213. 1753.

*Echites malabarica* Lamk., Encyl. Meth. Bot. 2: 342. 1786.

*Echites frutescens* (L.) Roxb., Hort. Beng. 20. 1814 (*nom. nud.*).

### Local name(s)

Paal-vally.

## Description

Twining **shrubs** with brown, cylindrical stem, 1.5-4.5m high; **branchlets** greenish, finely fulvous tomentose. **Leaves** simple, opposite, 3.5-7.5 x 1.5-3.5 cm, elliptic-oblong, glabrous above, glabrous or slightly pubescent and pale beneath, acute, obtuse or rounded at base, acute or acuminate at apex; **petioles** 0.2-0.5 cm long, stout. **Flowers** greenish white, in axillary and terminal rusty-pubescent, trichotomous, pedunculate cymes; **pedicels** 0.2-0.4 cm long, often three together, rusty-pubescent; **calyx** fulvous hairy, divided half way down with ovate, acute lobes; **corolla** tube 0.2-0.3 cm long with a narrow portion below, middle portion inflated over the stamens and the upper portion constricted below the lobes with each lobe upto 0.5 cm long, greenish-white, pubescent on the upper side, broad and oblong at the base, produced at the apex into long, falcate, slender, twisted acumens, deflexed in bud and flower; **disk** of 5 erect, linear lobes, longer than the hairy ovary. **Follicles** 3-5 x 0.3-0.4 cm, straight or slightly curved, slender, cylindrical, rusty-pubescent when young, glabrous when mature; seeds 1-2 cm long, linear, black with scanty, white coma.

## Ecology

Very common shrubaceous climbers covering the top of hedge plants, bushes, stream-side plants and a boarder species of the moist and dry deciduous forest areas. This is also one of the characteristic species of secondary forests, clear-celled forest plantations and other open areas. During July to September the plant is in bloom and fruits ripen by December.

## Distribution

### Kerala

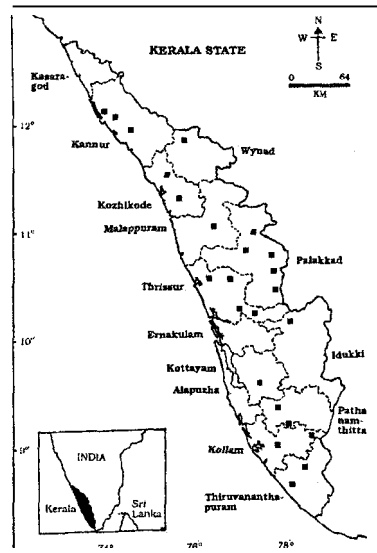
Cannanore, Wynad, Calicut, Malappuram, Palghat, Trichur, Idukki, Kottayam, Alleppy, Pathanamthitta, Quilon and Trivandrum districts; almost throughout the State (Map 83).

### World

Western Himalayas through India to Sri Lanka, South-East Asia, Australia.

## Products and uses

Roots of the plant are used in medicine and as a substitute for the Indian Sarsaparilla. The roots possess demulscant, alterative, tonic, diaphoretic and



Map 83 Distribution of *Ichmocarpus frutescens* (L.) R. Br. in Kerala.

diuretic properties (Anonymous, 1959) and are used to cure fever, dyspepsia and skin diseases. The root powder mixed with milk is curative for diabetics, bladder disorders and is also a blood purifier. The slender, wiry branches are used for tying purpose and for making baskets and fishing nets.

### Production and marketing

Along with the Indian Sarasaparilla (ie. roots of *Hemidesmus indicus* R. Br.) the roots of *I. frutescens* are also marketed (Anonymous, 1959). It is sold when fresh or as dried material, either entire or cut into pieces. However, The Kerala State SC & ST Federation (1998) had not recorded any details on the quantity of the item they handled or the market price of it as per their records for 1994-95 to 1996-97.

### References cited

- Anonymous, 1959. *The Wealth of India: Raw Materials*. vol. 5. CSIR, New Delhi. pp. 162-163.
- Kerala State SC & ST Federation 1998. Different items of LFPP handled during 1994-95 to 1996-97 and price fixed by MFP Committee per kilogram for 1997-98. Trivandruna (unpublished).

## 84. INDIGOFERA TINCTORIA L. (Fabaceae)

### Nomenclature

*Indigofera tinctoria* L., Sp. Pl. 751. 1753; Wt., Ic. Pl. Ind. Orient. t. 365, 1840; Baker in Hook. f., Fl. Brit. India 2: 99. 1876; Rama Rao, Fl. Pl. Trav. 109. 1914; Gamble, Fl. Presid. Madras 1:312. 1918. Krishnam., Min. For. Prod. India 67, 341, 351, 450. 1993.

*Indigofera sumatrana* Gaertn., Fruct. 2: 317. t. 148. fig. 4. 1891; Gamble, Fl. Presid. Madras 1: 312. 1918.

### Local name(s)

Amari, Dronika, Grymina, Madhuparnika, Nilam, Nili, Rajani, Neela-Amari.

### Description

Erect **undershrubs**, 1-15 m high with twiggy, woody, thinly silvery branches. **Leaves** 1-2 cm long, alternate, imparipinnate, stipulate; **leaflets** 7-13, opposite, ovate or ovate-oblong, membranous, entire, bluish above, glaucous below, shortly mucronate at apex; **petioles** upto 0.1 cm long. **Flowers** rose-coloured in axillary racemes 5-10 cm long; **pedicels** upto 0.7 cm long; **calyx** 5 partite, united below with subulate lobes; **corolla** papilionaceous, exserted with ovate petals; **stamens** diadelphous; **pistil** with sessile ovary, short incurved style and capitate stigma. **Pods** about 2.5 cm long, cylindrical, linear, minutely hispid, glabrous, deflexed, 9-12 seeded.

## Ecology

Along road sides and in waste places, mostly growing as a weed. The plant is also in cultivation and it flowers and fruits during October to December.

## Distribution

### Kerala

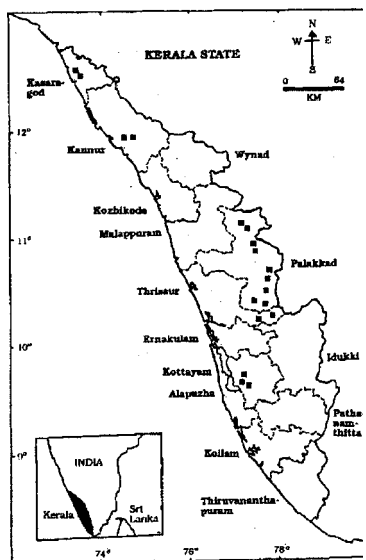
Cannanore, Palaghat, Trichur and Kottayam Districts (Map 84).

### World

South and South-East Asia, tropical Africa, introduced in tropical America.

## Products and uses

Roots, leaves or the plant as such is used in medicine. Due to the antitoxic property, it is a proven remedy against all poisonous affections. In the Ayurvedic system of medicine, it is a reputed drug for hair growth and forms a major ingredient in hair tonics and hair oils. Nili is purgative in action, bitter and hot and cures urinary diseases, giddiness, abdominal enlargement (ascites), enlargement of spleen, vatarakata, gout and intestinal obstructions. An extract of the plant is given for epilepsy and nervous disorders. It is also a remedy for bronchitis and as an ointment for sores, prolonged ulcers and haemorrhoids (Kirthikar and Basu, 1918). The leaves of *I. tinctoria* is externally applied as a poultice in various skin affections like scabies and to heal wounds and ulcers. Juice of leaves is also remedial to asthma, whooping cough, palpitation of the heart, lung diseases, kidney complaints and hydrophobia. The roots are also medicinal for hepatitis, bladder stones, urinary complaints and epilepsy (Nadkarni, 1976; Aiyer & Kolammal, 1960). Krishnamurthy (1993) had also reported the use of roots for dental care. The leaves and flowers of the plant is the source of the commercial dye Indigo (Krishnamurthy, 1993).



Map 84 Distribution of *Indigofera tinctoria* L. in Kerala

## References cited

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- Kirthikar, K.R. and B.D. Basu 1918. *Indian Medicinal Plants*. vol. 1. Allahabad. p. 713.
- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi. pp. 67, 341, 351, 450.

Nadkarni, A.K. 1976. *Indian Materia Medica*. vol. 1. Popular Prakashan, Bombay. p. 681.

**85. INDOCALAMUS WIGHTIANUS (NEES) NAKAI**  
( **Bambusaceae** )

**Nomenclature**

*Indocalamus wightianus* (Nees) Nakai, J. Arn. Arbor. 6: 148. 1925; Bahadur, Indian J. For. 2: 240. 1979; Varm. *et* Pant, Indian For. 107: 671. 1981; Tew., Monogr. Bamb. 103. 1992.

*Arundinaria wightiana* Nees, Linnaea 9: 482. 1834; Gamble, Ann. Roy. bot. Gardn. Calcutta 7: 4, pl. 2. 1896 & in Hook.f., Fl. Brit. India 7: 377. 1897; Bourd., For. Trees Trav. 397-398. 1908; Rama Rao, Fl. Pl. Trav. 466. 1914; Fisch. in Gamble, Fl. Presid. Madras 3: 1857. 1934.

**Local name(s)**

Chewari.

**Description**

Shrubby bamboos upto 3 m high; **culms** 0.7-1 cm in diameter, dark-green turning yellowish brown on maturity with internodes upto 20 cm long, very rough, striate, usually flattened on one side, swollen and ringed at nodes; **culm-sheath** 5-15 cm long, striate, thin rough, narrowed upwards, stiff hairy. **Leaves** upto 13 x 2 cm, ovate-lanceolate, thin, glabrous above, glaucous beneath, scabrous along the margins, narrowed towards base into a short swollen petiole, long acuminate at apex. **Flowers** (spikelets) purplish, almost 1 cm long, in terminal or axillary panicles, 2 flowered; **glumes** 2 empty, ovate-acute, membranous; **palea** 2 keeled, ciliate along the keels; **stamens** 3 with short filaments and brown basifixed acute anthers; **pistil** with ovoid-oblong, glabrous ovary, undivided style and two plumose stigmas. **Caryopsis** upto 0.5 cm long, elliptic, deeply furrowed on one side, acute at apex.

**Ecology**

This densely gregarious bamboo is mostly confined to the deciduous forests of the State, at medium and high elevations. In the evergreen forests they constitute a part of the ground flora and become gregarious when sufficient moisture is available. It flowers almost annually and the culms do not die after seed dispersal (Blatter, 1930). Gamble (1896) had reported that the species had flowered during 1883-1889 in different parts of India. In Kerala, the bamboo had flowered in June, 1982, as noted from herbarium specimens.

**Distribution****Kerala**

Palghat and Idukki districts; confined to highlands of the State (Map 85).

**World**

Peninsular India in Kerala and Tamil Nadu.

**Notes**

In South India there is a variety under the species namely *Indocalamus wightianus* var. *hispidus* Nakai which is very common in the hills of Nilgiris, especially at higher elevations like Dodabetta, Kundahs, Sispara, Makurthi, and so on as a typical undergrowth in shola forests and adjoining open grasslands. This species of bamboo is not included in Krishnamurthy's (1993) work.

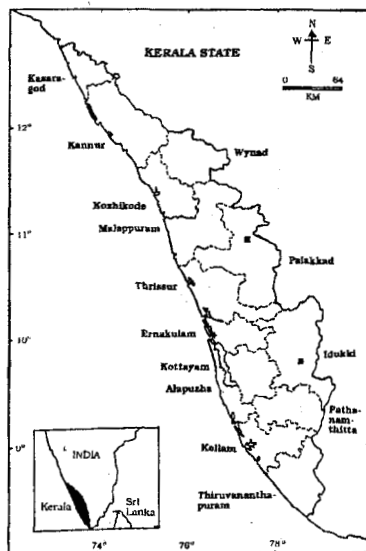
**Products and uses**

The split culms of this bamboo are used for making mats, baskets and fences.

It is also made into walking sticks. Young shoots are reported to be edible (Rama Rao, 1914).

**References cited**

- Blatter, E. 1930. Flowering of Bamboos. Part I. *J. Bombay Nat. Hist. Soc.* 33: 899-921.
- Gamble, J.S. 1896. The Bambusaceae of British India. *Ann. Roy. bot. Gardn. Calcutta* 7: 1-133.
- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi.
- Rao, M. Rama 1914. *Flowering Plants of Travancore*. Govt. Press, Trivandrum. p. 446.



Map 85. Distribution of *Indocalamus wightianus* (Nees) Nakai in Kerala.

**86. IPOMOEA MAURITIANA (L.) JACQ.  
(Convolvulaceae)**

**Nomenclature**

*Ipomoea mauritiana* (L.) Jacq., *Collect.* 4:216. 1791; Nicol. *et al.*, *Intrp. Hort.* 92.1988.

*Convolvulu paniculatus* L., *Sp. Pl.* 156. 1753.



*Ipomoea paniculata* (L.) R. Br., Prodr. 486. 1810; (*non* Burm. f. 1768); Gamble, Fl. Presid. Madras 2: 918. 1879.

*Ipomoea digitata* auct. (*non* L., 1759); Clarke in Hook. f., Fl. Brit. India 4: 202. 1883; Rama Rao, Fl. Pl. Trav. 277. 1914.

### Local name(s)

Palmuthakku.

### Description

Perennial, twining **herbs** with tuberous roots, upto 5 m high; **branchlets** glabrous. **Leaves** simple, alternate, palmately lobed, upto 15 x 18cm, broader than long, 5-7 lobed with lobes ovate-lanceolate, entire, glabrous, acute or acuminate at apex; **petioles** 4-12 cm long, glabrous. **Flowers** reddish purple or pink in many flowered, axillary, corymbosely paniculate cymes, upto 12 cm long; **pedicels** 0.5-1 cm long; **calyx** 5-lobed, each upto 1 cm long, orbicular-oblong, concave, glabrous, subobtusate at apex; **corolla** 5-lobed, 4-5 cm long, campanulate or infundibuliform with lobes emarginate at apex; **stamens** 5, included in the corolla tube, with filiform, often unequal filaments, dilated below and anthers, straight or contorted; **pistil** with 2-loculed ovary, filiform style and capitate stigma. **Capsules** about 1 cm long, 4-loculed, 4-valved, with persistent calyx; **seeds** almost 0.5 cm long, brownish-cottony hairy.

### Ecology

Twining herbs frequent in the moist deciduous forests, flowering during July-August and bearing fruits during September to December.

### Distribution

Kerala

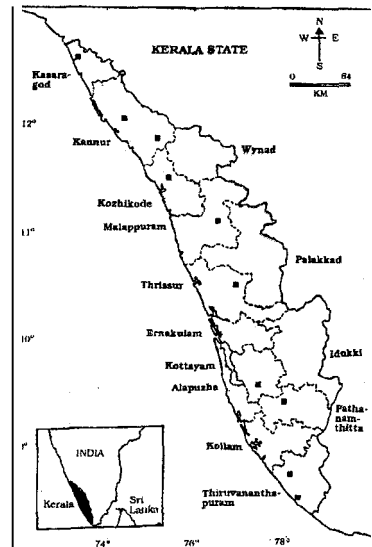
Kasaragod, Cannanore, Calicut, Malappuram, Trichur, Kottayam, Pathanamthitta and Trivandrum districts; almost throughout the State, in the low and midlands (Map 86).

World

Pantropical.

### Notes

In Indian Floras, this plant is dealt with under the name *I. digitata* L., which, in fact, is a species confined to Haitian



Map 86 Distribution of *Ipomoea mauritiana* (L.) Jacq in Kerala

(Shah, 1969). This species of medicinal use, excessively extracted from the forests of Kerala has not been included in the work of Krishnamurthy (1993).

### Products and uses

The tuberous roots of the plant are brittle, mucilagenous and bitter to taste and they contain a resin which is medicinal as tonic, alterative, demulcent, lactagogue, cholagogue, etc. It is reported (Anonymous, 1959) that dried and powdered roots of the plant are curative of spleen and liver complaints, debility, fat accumulation, and so on. The stem and leaves of the plant make fodder and the leaves also contain carotene at the rate of 6.3 mg/100 gm.

### Production and marketing

The tubers of the plant is the material collected and marketed as a forest produce. During 1996-97, the Kerala State SC & ST Federation (1998) received about 50,000 kg of the item at the rate of Rs. 4.75 per kg which was disposed off at the cost of Rs. 5.00 per kilogram.

### References cited

- Anonymous, 1959. *The Wealth of India: Raw Materials*. vol. 5. CSIR, New Delhi. p. 248.
- Kerala State SC & ST Federation 1998. Different items of LFPP handled during 1994-95 to 1996-97 and price fixed by MFP Committee per kilogram for 1997-98. Trivandrum (unpublished).
- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi.
- Shah, G.L. 1969. Nomenclatural changes in some Bombay plants - III. *J. Bombay nat. Hist. Soc.* 66: 232.

## 87. KAEMPFERIA GALANGA L. ( Zingiberaceae )

### Nomenclature

*Kaempferia galanga* L., Sp. Pl. 1:2. 1753; Wt., lc. Pl. Ind. Orient. t. 899. 1844-45; Baker in Hook.f., Fl. Brit. India 6: 219. 1890; Rama Rao, Fl. Pl. Trav. 401. 1914; Fisch. in Gamble, Fl. Presid. Madras 3: 1039. 1928; Burt et Smith, Notes Roy. bot. Gardn. Edinburgh 3 1: 185. 1972; Rao et Verm., Bull. bot. Surv. India 14: 124. 1972; Nicol. *etal.*, Intrap. Hort. Malab. 318. 1988.

*Alpinia sessilis* Koen. in Retz., Obs. 3: 50('62'). 1783.

### Local name(s)

Kacholam,

## Description

Rhizomatous **herbs** with aerial leaves spread on the ground; **tubers** much branched, upto 1.5cm in diameter. **Leaves** 10-15 x 6-10 cm, rotund-ovate or deltoid, deep green above, pale beneath, 10-12 nerved, acuminate at apex; **petioles** short, channelled. **Flowers** white, fragrant in clusters of 10-12, from the centre of spreading leaves, enclosed in imbricated leaf sheaths; **bracts** upto 4 x 1 cm, lanceolate, green; **calyx** upto 3 cm long, pale greenish-white; **corolla** tube 3.5-4.5 cm long, narrowly lanceolate, lobed half way; **lateral staminodes** white, almost 2 cm long, obovate; **labellum** white with violet bands at the base, upto 2.5 cm across, broader than long, bilobed with sessile, bilobed anthers strongly reflexed and the connective extended into a quadrate, bilobed appendage; **pistil** with 3-loculed ovary, enclosing many ovules on axile placenta, long, filiform, style and turbinate stigma. **Capsules** oblong, with thin pericarp; **seeds** subglobose with a small, lacerate aril.

## Ecology

Aromatic herbs with underground stem and devoid of pseudo-aerial stem but only aerial leaves spreading on the soil surface. The plant is seen only very rarely in the natural forests and is more often cultivated. In natural conditions, the plant grows in shaded, humid areas of moist deciduous forests. Flowers open mostly during August-September.

## Distribution

### Kerala

Calicut, Malappuram, Palghat, Quilon and Trivandrum districts; cultivated almost throughout the State, mainly in the midlands (Map 87).

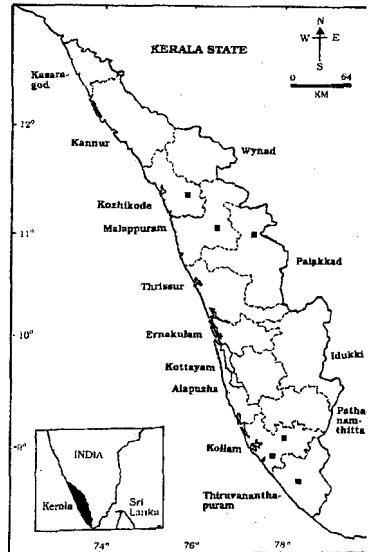
### World

Native to India, cultivated in Sri Lanka and Malesia also.

## Notes

This species of much economic potential is cultivated extensively in Kerala.

Rarely, it is seen growing wild, may be as an escape. The species is included in this work mainly because it is often grown by tribals who dwell in forest areas, who collect rhizomes from plants growing wild.



Map 87. Distribution *Kaempferia galanga* in Kerala

### Products and uses

Aromatic, tuberous rhizome is the main part extracted from this plant. It is used both in perfumery and as a medicine against cough, pectorial affections, dyspepsia, headache, malaria, rheumatism, etc. (Anonymous, 1959), administered in various forms and combinations. Along with betel and arecanut, it is also chewed as a masticatory. The leaves are also medicinal, which in lotions and as poultice, cure sore-eyes, sore-throat, rheumatism and fever.

### Reference cited

Anonymous, 1959. *The Wealth of India: Raw Materials*. vol. 5. CSIR, New Delhi. pp. 314-315.

## 88. KINGIODENDRON PINNATUM (ROXB. EX DC.) HARMS (Caesalpiniaceae)

### Nomenclature

*Kingiodendron pinnatum* (Roxb. ex DC.) Harms in Engl. *et* Prantl., Pflanzenfam. 1: 194. 1897; Gamble, Fl. Presid. Madras 1: 412. 1919; Meeuwen, Blumea 18: 48. 1970; Krishnam., Min. For. Prod. India 282,298. 1993.

*Hurdwickia pinnata* Roxb. (Hort. Beng. 33.1814, *nom. nud.*) ex DC., Prodr. 2: 487. 1825; Wt. *et* Arn., Prodr. 284. 1834; Bedd., Fl. Sylvat. South. India t. 255. 1872; Baker in Hook.f., Fl. Brit. India 2: 270. 1878. Bourd., For. Trees Trav. 128. 1908; Rama Rao, Fl. Pl. Trav. 141. 1914.

### Local name(s)

Kodapala, Kulavu, Shurali

### Description

**Trees**, 20-30 m high and upto 1 m in girth; **branches** spreading. **Leaves** alternate, compound, with only one pair of leaflets; **rachis** 5-9 cm long, bristled at the apex; **leaflets** 3.5-7 x 1.5-4cm, ovate-elliptic, elliptic or falcoid, glabrous, tinged with red when young, rounded or acute at base, acuminate or cuspidate at apex; **petiolules** upto 0.5 cm long or rarely very short. **Flowers** white in axillary or terminal, 2-5 cm long, racemose, pubescent panicles; **pedicels** almost 0.1 cm long, stout, pubescent; **calyx** upto 0.5 cm long, with oblong, membranous, veined and often dotted lobes; **corolla** absent; **stamens** usually 10 with slender filaments villous at base and smooth, versatile anthers; **pistil** with wooly ovary, very short style and peltate stigma. **Pods** 2.5-3.5 x 2-2.5 cm, strap-shaped, veined, narrowed at both ends; **seed** one, towards the apex of the pod.

## Ecology

Evergreen trees in semi-evergreen forest areas, especially growing in the river valleys and forest foldings and depressions. Flowers are produced during the dry months of January to May and fruits are borne from May to October.

## Distribution

### Kerala

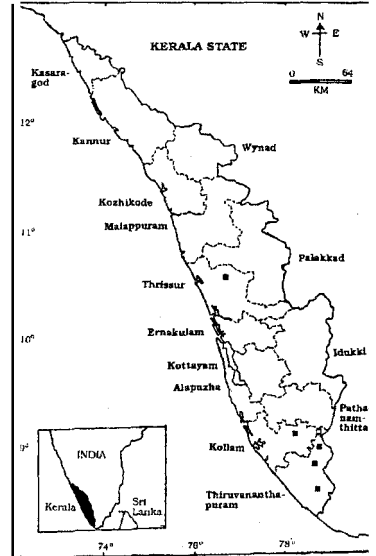
Trichur, Quilon and Trivandrum districts; rather confined to hilly uplands and highlands (Map 88).

### World

South-West India, in Karnataka and Kerala.

## Notes

The species is at present placed under the genus *Kingiodendron*, different from *Hardwickia* Roxb. under which it was all along treated. The two genera can be separated by the following characters (Meeuwen, 1970).



Map 88. Distribution of *Kingiodendron pinnatum* (Roxb. ex DC.) Harms in Kerala.

## Products and uses

The tree yields a dark brown oleoresin on boring holes of approximately 2 cm diameter into the main trunk, reaching the pith portion. The watery exude is collected in containers and the tapping hole is plugged with wood when the flow ceases. Healthy and huge trees of 8 feet girth yield upto about 50 litres of the oleoresin at a time, and tapping is done at an interval of about 10 years on the same tree. The oleoresinous exudate is used as wood varnish after thinning with turpentine. The oleoresin also yields a volatile oil on steam distillation and the resin left behind after distillation is used in the preparation of spirit. The oleoresin is also reported to be used (Anonymous, 1959) in the treatment of the venereal diseases.

Krishnamurthy (1993) notes that oil from seed is useful for the manufacture of soap and varnishes. The leaves constitute fodder and the timber is very durable, often used as piles in the foundations of buildings and bridges.

## Production and marketing

A mature, healthy tree of about 3 metres girth yield about 50 litres gallons of the oleoresin on tapping (Anonymous, 1959) which may go upto 150 litres.

The Kerala State SC & ST Federation (1998) is not dealing with the item and therefore the cost of the item is not known.

### Regeneration

This large evergreen trees favour shaded and moist conditions of the evergreen forests and regenerate abundantly by seeds (FRI, 1983). However, its natural population in the forests of Kerala is rather very poor at present.

Artificially, the tree can be regenerated from seeds. Pods containing seeds ripen during May-July or sometimes by October. About 160-280 seeds weigh one kilogram and the seeds remain viable for less than a year (Dent, 1948) in storage. Germination percentage of seeds is about 85 and plant percent around 80. The seeds germinate within 15 to 90 days after sowing. Nursery with partial shade is preferable for raising seedlings and the beds are to be of the raised type. When seedlings attain 3-6 months old, they can be planted out in the field, especially in forest gaps. Direct sowing of seeds has also been practised. Also, stump-planting after one year growth of seedlings in the nursery has also been reported to be successful, especially in Kerala conditions.

### References cited

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- Dent, T.V. 1948. The storage of seeds of Indian forest plants. *Indian Forest Records-New Series 7(1) Silviculture*. Manager of Publications, New Delhi.
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## 89. KYDIA CALYCINA ROXB. ( Malvaceae )

### Nomenclature

*Kydia calycina* Roxb., Hort. Beng. 50. 1814 (*nom. nud.*) Pl. Corom. 3: 11, t. 215. 1819 & Fl. Indica 3: 188. 1832; Bedd., Fl. Sylvat. South. India t. 3: 1869; Mast. in Hook.f., Fl. Brit. India 1: 348. 1874; Bourd., For. Trees Trav. 47.

1908; Rama Rao, Fl. Pl. Trav. 44. 1914; Dunn in Gamble, Fl. Presid. Madras 1: 93. 1915; Paul in Sharma *et* Sanjapp. (ed.) Fl. India 3: 344. 1993; Krishnam., Min. For. Prod. India 389,421,509. 1993.

*Kydia fraterna* Roxb., Pl. Corom. 3: 12, t. 216. 1819.

*Kydia roxburghiana* Wt., Ic. Pl. Ind. Orient. 3. t. 881. 1844.

**Local name(s)**

Kattavanakku, Nedu-naru, Vellachadachi, Velukku, Venta.

**Description**

Deciduous **trees**, 10-15 m high; **branchlets** densely pubescent with minute, greyish hairs. **Leaves** simple, alternate, 4-11 x 3-13, suborbicular or ovate-rounded, entire or irregularly serrate, 3 or 5 lobed, stellate-hispid above, stellate-pubescent beneath, 5-9 nerved from the base, rounded or subcordate at base, acute or obtuse at apex; **petioles** 2-6 cm long, densely stellate-pubescent. **Flowers** white or pinkish, polygamous, in axillary or terminal panicles; **pedicels** 0.5-1.5 cm long, stellate-pubescent; **calyx** cupular, connate at base with 5, about 0.5 x 0.4 cm, ovate-acute lobes, stellate-pubescent on both the sides; **corolla** upto 1.5 cm across, 5-lobed with petal lobes longer than the calyx lobes, obcordate, adnate at base with the staminal column; **stamens** in a 5-branched staminal column, upto 0.3 cm long, tipped by 4 to 6 cuneate anthers; **pistil** with trilocular, ovoid ovary, 3 styles and peltate stigma lobes. **Capsules** upto 0.5 cm across, subglobose, wooly hard; **seeds** brown, about 0.3 x 0.2 cm, almost reniform-ellipsoid, glabrous, glandular.

**Ecology**

Small to medium sized trees, confined to mainly evergreen and semi-evergreen forests of the State. Flowers during September to November and fruits by November to February.

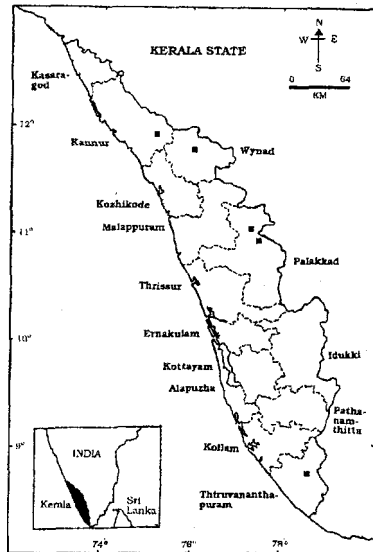
**Distribution**

Kerala

Cannanore, Wynad, Palghat and Trivandrum districts; northern and southern parts of the State, mainly in the highlands (Map 89).

World

India, Pakistan, Nepal, Bhutan, Myanmar, China.



Map 89. Distribution of *Kydia calycina* Roxb. in Kerala.

### Products and uses

Apart from construction work, the wood is also used for the manufacture of match boxes, splits, packing cases, agricultural implements, etc. The wood is also the source of commercial potatoh (yield upto 0.41%) as reported (Anonymous, 1959). Inner bark yields a fibre locally used for making coarse ropes (Paul, 1993), cordages and as elephant drag ropes. Krishnamurthy (1993) had reported that the mucilagenous substance extracted from the bark of the tree is used for clarifying sugarcane juice. The bark is also the source of a gum. Medicinally, leaf-paste is used for relieving body pains and as poultice, the leaves cure skin diseases (Anonymous, 1959). When chewed, the leaves are also recorded to promote saliva formation.

### Regeneration

*K. calycina* is a strong light-demander, especially in the sapling and pole stages. It is also a frost-hardy and draught resistant. It coppices very well, pollards satisfactorily and also produces root suckers. Natural regeneration of the species from seeds is rather profuse and the seedlings grow fast after about a year in favourable conditions (Luna, 1996).

The tree can also be regenerated artificially from seeds. Often seed-bearing twigs are collected from standing trees, rubbed in cloth bag to separate seeds and cleaned by winnowing. The seeds ripen mostly during February-March. About 37000 fruits weigh one kilogram and seeds being minute, 780000 to 2,00,000 numbers of them make one kilogram. However, germination percentage and plant percent are very low for the species (Luna, 1996) which is 6-12 and about 6, respectively. Therefore, only about 46,000 seedlings will be available from one kilogram of seeds (FRI, 1975). In the nursery, seeds are usually sown in lines, 20 cm apart, and watered intermittently. Germination will be completed within 16-28 days and in the nursery, a spacing of 10 x 10cm around each seedling will give the highest plant percent (Rajkhowa, 1961). Seedlings, when attain a height of 5-8 cm, can be either transplanted in the field or allowed to grow to stump size before outplanting (Luna, 1996). Direct sowing of seeds at the beginning of South-West monsoon is also another method to artificially regenerate the species.

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- Rajkhowa, S. 1961. Studies on mutual competition among forest seedlings. *Indian For.* 90: 219-224.

**90. LIMONIA ACIDISSIMA L.**  
( **Rutaceae** )

**Nomenclature**

*Limonia acidissima* L., Sp. Pl. ed. 2: 554. 1762, *excl. cit.* Rheede Hort. Malab. t. 4: 14. 1678 (*non* Hook.f. in Hook.f., Fl. Brit. India I: 507. 1875); Airy Shaw in Kew Bull. 1939: 293. 1939; Panigrahi, Taxon 26: 576. 1977; Nicol., Taxon 25: 551. 1978; Krishnam., Min. For. Prod. India 69. 1993.

*Schinus limonia* L., Sp. Pl. 389. 1753.

*Feronia elephantum* Cory., Trans. Linn. Soc. London 5: 225. 1800; Wt. *et* Arn., Prodr. 96. 1834; Wt., Ic. Pl. Ind. Orient. t. 15. 1838; Bedd., Fl. Sylvat. South. India t. 121. 1871; Hook.f. in Hook.f., Fl. Brit. India 1: 516. 1875; Bourd., For. Trees Trav. 64. 1908; Rama Rao, Fl. Pl. Trav. 66. 1914; Gamble, Fl. Presid. Madras 1: 160. 1915.

*Feronia limonia* (L.) Swingle, J. Wash. Acad. Sci. 4: 328. 1914.

*Limonia elephanturn* (Corr.) Panigrahi, Taxon 26: 576. 1977.

**Local name(s)**

Vlathi.

**Description**

Armed **trees**, 4-6 m high with numerous branches and whitish bark; **thorns** 1.5-4 cm long, straight, sharp. **Leaves** alternate, imparipinnate, 6-10 cm long, narrowly winged, glabrous with flat rachis; **leaflets** opposite, in 2 or 3 pairs with an odd terminal one, subsessile, 2-3.5 x 1.5-3 cm, ovate or obovate, glabrous, entire, narrowly obtuse at base, obtuse at apex. **Flowers** dull reddish, in paniculate, sessile cymes produced from the axils of fallen leaves; **peduncles** slender, pubescent; **calyx** 4 lobed, very small with the lobes ovate, acute; **corolla** with 4 petals, each upto 0.5 cm long, elliptic-oblong or ovate, spreading, ciliate, acute at apex; **stamens** 7-12, free, with subequal, short, linear-subulate filaments and prominent anthers; **disc** finely woolly; **pistil** with multi-locular, papillose ovary, short style and fusiform stigma. **Berries** upto 1.5 cm across, globose, rough, whitish, 1-4 seeded; **seeds** embedded in mucilage, oblong, compressed.

## Ecology

Graceful, deciduous trees, rather rare in the moist deciduous forests of Kerala. Flowers during March to May and fruits ripen by October-November.

## Distribution

### Kerala

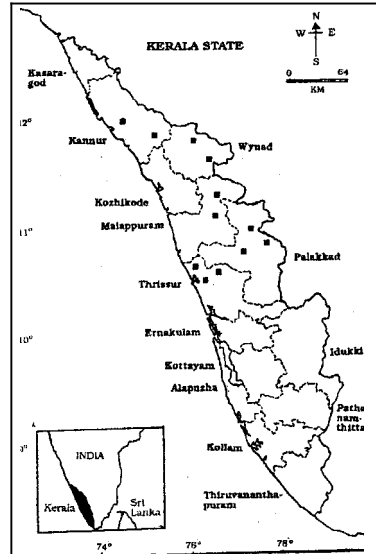
Cannanore, Wynad, Malappuram, Palghat and Trichur districts; almost throughout the State, especially in the northern part (Map 90).

### World

India, Sri Lanka, Myanmar.

## Notes

*Limonia* L. (1762) is a monotypic genus. For a long time, the generic name *Limonia* L. was rejected as an orthographic variant of the Plumbaginaceae genus *Limonium* Miller (1754). The legitimacy of *Limonia* L. is presently upheld in accordance with the International Code of Botanical Nomenclature



Map 90. Distribution of *Limonia acidissima* L. in Kerala

Panigrahi (1977) is of the opinion that the name *Limonia acidissima* L. should be rejected as a *nomen ambiguum*. However, in the light of the arguments of Stone and Nicolson (1978), the name *L. acidissima* is accepted here as the valid name of the species and therefore, the binomial *L. elephantum* (Corr.) Panigrahi is treated here as a synonym of the same. Wood apple is the plant which Rheede (Hort. Malab. 4: t. 12. 1678) had illustrated with spinous stem (*Tseru Katou Naregam*) and not *Katu Tseru Naregam* (Rheede, Hort. Malab. 4: t. 14. 1678) which is *Naringi crenulata* (Roxb.) Nicolson (syn. *Hesprethusa crenulata* (Roxb.) Roem.), with which it is often confused in literature. More details on the identity and nomenclature of the two species has been given by Swingle (1914), Panigrahi (1977), and Stone and Nicolson (1978).

## Products and uses

Fruits are edible. They are also medicinal, so also the leaves and bark. Gum produced in the trunk and branches, similar to gum arabic, is also a non-timber product extracted from the tree.

Leaves possess carminative and astringent properties and fruits are astringent, stimulant and antiscorbutic. The gum from the bark of the trunk and

branches of the tree is reported to be used as an ingredient of writing ink in Java (Anonymous, 1959) and is also useful for dyeing and colouring. Also, the bark is reported (Krishnamurthy, 1993) to be used locally in the treatment of venereal diseases.

### Regeneration

This moderate-sized tree is fairly draught resistant. The tree flowers usually after 15 years age and natural regeneration of it is by seeds. The seeds are dispersed by animals and man who eat the edible part of the fruit.

The fruits take several months to ripen and by October-November they become ripe and will continue to remain on the tree for few more months. About 40,000 to 50,000 thousand seeds weigh one kilogram (FRI, 1981) and both untreated and cold or hot water treated seeds give almost the same germination rate, i.e. around 66%, and the plant percent is about 63. The tree is also artificially regenerated by planting stem cuttings and by budding. Buds from mature trees, budded to seedlings are reported to result in dwarf plants which fruit early (FRI, 1981).

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- FRI, 1981. *Troup's Silviculture of Indian Trees*. vol. 3. Controller of Publications, Delhi. pp. 101-103.
- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi. p. 69.
- Panigrahi, G. 1977. Proposal to reject the name *Limonia acidissima* L. *nom. ambig. rejic.* in favour of *L. elephantum* (Corr.), Panigrahi *comb. nov. Taxon* 26: 576.
- Stone, B.C. and Dan H. Nicolson 1978. Arguments for *Limonia acidissima* L. (Rutaceae) and against its rejection as a *nomen ambigum*. *Taxon* 27: 551.
- Swingle, W.T. 1914. The name of the Woodapple *Feronia limonia*. *J. Washington Acad. Sci.* 4 : 325 - 328.

## 91. MADHUCA NERIIFOLIA (MOON.) H.J. LAM. ( Sapotaceae )

### Nomenclature

- Madhuca neriifolia* (Moon.) H.J. Lam., Bull. Jard. Bot. Buitzg. ser. 3, 7: 182, 265. 1925 (*pro parte*) & *ibid.* 8: 462. 1927; van Royen, Blumea 10: 98. 1960.
- Bassia neriifolia* Moon., Cat. Pl. Ceylon 36. 1824; Bedd., For. Man. 140. 1870; Clarke in Hook.f., Fl. Brit. India 3: 545. 1882.

*Bassia malabarica* Bedd., For. Man. 140. 1870 & Fl. Sylvat. South. India t. 254. 1872; Clarke in Hook. f., Fl. Brit. India 3: 544. 1882; Bourd., For. Trees Trav. 210. 1908; Rama Rao, Fl. Pl. Trav. 237. 1914; Gamble, Fl. Presid. Madras 2: 763. 1921.

*Mudhuca malabarica* (Bedd.) Parker, Indian For. 57: 489. 1931; Krishnam., Min. For. Prod. India 210. 1993.

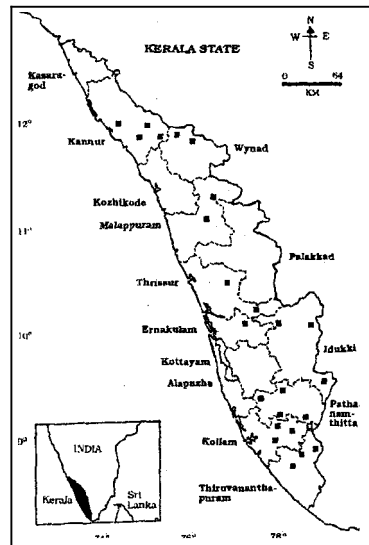
*Illipe malabarica* (Bedd.) Engl., Bot. Jahrb. 12: 509. 1890.

### Local name(s)

Attu-iluppa, Kattu-iluppa.

### Description

**Trees**, 8-12 m high; **branchlets** angular, ferruginously or greyish tomentose. **Leaves** simple, scattered, crowded at the apex of the branchlets, 4-14 x 1.5-4 cm, narrowly lanceolate-elliptic or elliptic, rarely spatulate, thin, coriaceous, entire, glabrous, narrowly cuneate at base, obtuse at apex; **petioles** 0.5-1.2 cm long, flat above, glabrous or rarely rugose below. **Flowers** creamy or yellowish white, in 2-4 flowered clusters or solitary, fascicled and crowded at the apex of branchlets among leaves; **pedicels** 1.5-2 cm long, thickened towards apex, glabrous; **calyx** 4-lobed with sepals 0.5-0.8 x 0.4-0.6 cm, ovate, hairy outside, glabrous inside, acute or obtuse at apex; **corolla** upto 1.5 cm long, 8-lobed, with ovate-oblong lobes, densely wooly inside between the stamens; **stamens** 16, in 2 indistinct whorls, 0.3-0.5 cm long, yellowish hirsute with sagittiform anthers upto 0.3 cm long, each with a terminal acumen; **pistil** with ovary upto 0.2 cm long, 8-loculed, glabrous with filiform style upto 0.2 cm long and often punctiform stigma. **Berries** upto 4.5 x 0.7 cm, ovoid-ellipsoid, fleshy, brown-tomentose with reminescent of the style at apex, 1-seeded; **seeds** shiny crutaceous, ellipsoid, more or less compressed.



Map 91. Distribution of *Madhuca nerifolia* (Moon.) H.J. Lam in Kerala.

### Ecology

Trees, common in the moist deciduous forests, mostly along the banks of hill streams and rivulets, forming part of the riparian vegetation. Flowers during December to March and fruits mature by April-May.

**Distribution****Kerala**

Cannanore, Wynad, Malappuram, Trichur, Ernakulam, Idukki, Pathanamthitta, Quilon and Trivandrum districts; almost throughout the State, mainly from the mid to the highlands (Map 91).

**World**

Peninsular India, Sri Lanka.

**Products and uses**

Flowers, fruits and seeds of the tree are medicinal and hence extracted on a large scale. Flowers are reported to be used in kidney complaints, fruits against rheumatism, biliousness, asthma and worm complaints and seed-oil to cure rheumatism (Nambiar, *et al.* 1985). Babu (1990) has reported that wood of the tree is also used in the Indian system of medicine.

Both flowers and seed-oil are edible as vegetable and cooking oil (Krishnamurthy, 1993) and the fatty oil obtained from seeds is also reported to be used in soap industry and as a hair-fixer.

**References cited**

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- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi. pp. 210-211, 299.
- Nambiar, V.P.K., N. Sasidharan, C. Renuka and M. Balagopalan. 1985. Medicinal Plants of Kerala Forests. *KFRI Reserach Report No. 42*. KFRI, Peechi. pp. 82-84.

**92. MALAXIS RHEEDII SW.  
(Orchidaceae)**

**Nomenclature**

- Malaxis rheedii* Sw., Kongal. Vetensk. Acad. Nya Handl. 21: 235. 1800; Seindenf., Bot. Tidsskr. 93: 97. 1978; Nair and Ansari, Taxon 30: 475. 1981.
- Microstylis versicolor* Lindl., Gen. Sp. Orchid. Pl. 21. 1830; Rama Rao, Fl. Pl. Trav. 392. 1914; Fisch. in Gamble, Fl. Presid. Madras 3: 985. 1928.
- Malaxis versicolor* (Lindl.) Abeyw., Ceylon J. Sci. Biol. Sci. 2(2): 147. 1959; Sant. et Kapad., J. Bombay nat. Hist. Soc. 58: 847. 1961.
- Microstylis rheedii sensu auctt. non* Lindl. 1830; Wt., Ic. Pl. Ind. Orient. t. 902. 1845; Hook. f. in Hook. f., Fl. Brit. India 5: 690. 1890;

**Local**

Jeevakam.

## Description

Terrestrial **herbs; stems** slender or stout, purplish, stoloniferous, 20-30 cm high including the inflorescence axis. **Leaves** 6-17 x 3-12 cm, elliptic or lanceolate, 5-7 nerved, wavy along margins, equal or subequal and narrowed at base, acute or acuminate at apex; **petioles** absent. **Flowers** greenish yellow or purplish in scapose racemes, variable in size, pungent smelling; **sepals** obtuse or linear obtuse, 3-veined, dorsal sepal often the longest and narrowest; **petals** lanceolate, obliquely, truncate, 1-veined and 9-10 toothed, subquadrate and pectinate; **stamens** with anthers 2-loculed, and subterminal with 4 pollinia in pairs, ovoid or obovoid.

## Ecology

A shola orchid adapted to humus in shade, but also growing in evergreen and moist deciduous forests, especially in rocky areas and among grasses. The plant flowers and bears fruits during July to November.

## Distribution

### Kerala

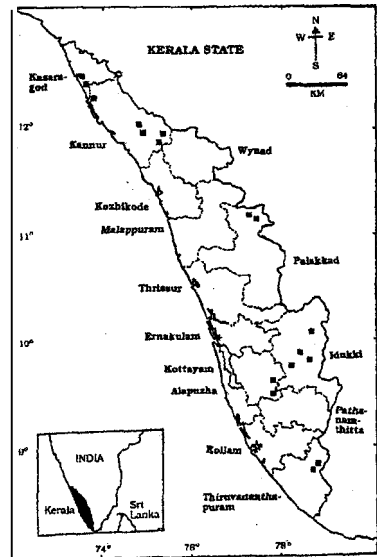
Cannanore, Palaghat, Idduki, Kottayam and Trivandrum Districts. (Map 92).

### World

Peninsular India, Sri Lanka.

## Products and uses

The swollen base of the aerial stem of the plant is the medicinal part known as Jeevakorn. It is sweetish, refrigerent, aphrodisiac, febrifuge and also tonic in properties. It is used for the treatment of haematemesis, fever, seminal weaknesses, burning sensation, dipsia, emaciation, tuberculosis and general debility (Warrier, *et al.* 1995).



Map 92. Distribution of *Malaxis rheedii* Sw. in Kerala.

## Production and marketing

The swollen base of the aerial stem of this high altitude orchid is the medicinal product extracted. Being mostly used in the fresh condition, only very little quantity of the product was available to the Kerala State SC & ST Federation during 1994-95 to 1996-97, which they disposed at the rate of Rs. 10.00per

**References cited**

Kerala State SC & ST Federation 1998. Different items of LFPP handled during 1994-95 to 1996-97 and price fixed by MFP Committee per kilogram for 1997-98. Trivandrum (unpublished).

Warrier, P.K., V.P.K. Nambiar and C. Ramankutty (eds.) 1995 *Indian Medicinal Plants*. vol. 5. Orient Longman, Madras. pp. 367-370.

**93. MESUA FERREA L.**  
(**Guttiferae**)

**Nomenclature**

*Mesua ferrea* L., Sp. Pl. 515. 1753; Wt. *et* Arn., Prodr. 102. 1834; Wt., Ic. Pl. Orient. t. 118. 1839; Bedd., Fl. Sylvat. South. India t. 64. 1871; Anders. in Hook.f., Fl. Brit. India 1: 277. 1874; Bourd., For. Trees Trav. 20. 1908; Rama Rao, Fl. Pl. Trav. 32. 1914; Gamble, Fl. Presid. Madras 1: 77. 1915; Sincl., Bull. bot. Soc. Bengal 9: 88. 1955; Mahesw., Bull. bot. Surv. India 5: 336. 1963; Nicol. *et al.*, Intrap. Hort. Malab. 84. 1988; Singh in Sharma *et* Sanjapp. (ed.) Fl. India 3: 136-137. 1993; Krishnam., Min. For. Prod. India 138, 213, 288, 311, 354. 1993.

*Calophyllum nagassarium* Burm.f., Fl. Ind. 121. 1768.

*Mesua roxburghii* Wt., III. Ind. Bot. 1: 127. 1840.

*Mesua nagana* Gardn., Calcutta J. Nat. Hist. 8: 4. 1847.

*Mesua thwaitesii* Planch. *et* Triana, Ann. Sci. Nat. ser. 4, Bot. 15: 305. 1861; Anders. in Hook.f., Fl. Brit. India 1: 278. 1874.

*Mesua nagassarium* (Burm.f.) Kosterm., Ceylon J. Sci. (Biol. Sci.) 12: 76. 1976.

**Localname(s)**

Nangu, Peri, Velutha-champakam, Velutha-pala.

**Description**

**Trees**, 20-25 m high with straight trunk; **bark** smooth, ash coloured. **Leaves** simple, opposite, 16-15 x 2-3.5 cm, linear-oblong or oblong-lanceolate, red when young, shiny above, glaucous beneath, coriaceous, rounded or acute at base, acute or acuminate at apex; **petioles** upto 0.8 cm long, stout.

**Flowers** white, fragrant, 2-5 cm across, subsessile, 1-3 together on short axillary or terminal peduncles; **calyx** with 4 sepals, each 1.2-1.5 cm long,



Fig. 29. *Mesua ferrea* L.

orbicular, cupped, persistent; **corolla** with 4 petals, 2-5 cm long, spreading, obovate-cuneate with crisped and undulate or often broken margins; **stamens** yellow, numerous, shorter than the petals, shortly united at the base with oblong, terminal anthers; **pistil** with ovoid ovary, style twice as long as the petals and peltate stigma. **Fruits** 2-2.5 cm long, ovoid with a conical point, surrounded by accrescent sepals; **seeds** 1-4, often 2, angular, smooth, brown (Fig. 29).

### Ecology

One of the dominant trees in the evergreen forests, habituated to the banks of hill streams and reservoirs, rivulets, and so on. In Kerala, the species occurs at altitudes ranging between 800-1500 m. The tree flowers mostly during January to April and fruits mature from October to March.

### Distribution

#### Kerala

Wynad, Calicut, Malappuram, Palghat, Trichur, Ernakulam, Idukki, Pathanamthitta, Quilon and Trivandrum districts; almost throughout the State, mainly from the mid to the highlands (Map 93).

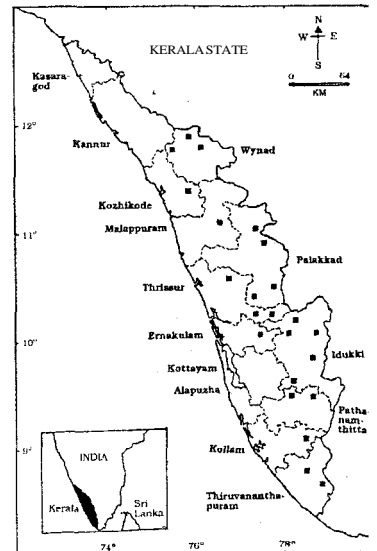
#### World

India, Nepal, Bangladesh, Sri Lanka, Myanmar, Malaysia, Indonesia, Vietnam, Cambodia, Thailand and Malacca.

### Notes

Kostermans (1976, 1980) had segregated *Mesua ferrea* L. - a complex species of Indo-Ceylonese-Malesian distribution - into two taxa, namely *M. ferrea* L. as confined to Sri Lanka and *M. nagassarium* (Burm.f.) Kosterm. representing the Indian specimens of the species. However, Stevens (1986) had again merged the two taxa and considered the Indo-Sri Lankan species as one and the same, attributing the name *M. ferrea* to the taxon as it was known earlier.

It is the typical variety under the species, namely var. *ferra* which is found in Kerala and the other variety, viz. var. *coromandeliana* (Wt.) Singh is confined to Tamil Nadu and Karnataka States of Peninsular India.



Map 93. Distribution of *Mesua ferrea* L. in Kerala



### Products and uses

Seed oil, oil cake, flowers, an oleoresin extracted from immature fruits and bark are the major products, other than the ironwood timber, for which the species is well known. The seed oil, reddish or dark brown in colour with an unpleasant odour, is mainly used in soap industry and as illuminant and lubricant. The oil-cake with toxic constituents, rich in nitrogen and phosphorous, makes good manure. Oleoresin from fruits and bark of the tree is a substitute for Canada balsam and flowers, flower buds and fragrant stamens are used in cosmetic, soap and perfume industries. Nambiar, *et al.* (1985) had given several other medicinal uses of the root, bark, leaves, flowers and seed-oil of this plant. Also, Krishnamurthy (1993) had reported that the fruits are edible and flowers as the source of a yellow dye.

### Production and marketing

The non-wood forest produce procured by the Kerala State SC & ST Federation from *M.ferrea* trees is the dried seeds. During 1994-95 to 1996-97, the quantity of seeds available to the Federation through its network of collection centres in the State is only about 754 kg, procured at the rate of Rs. 9.50 per kg and sold for Rs. 10.00 per kilogram.

### Regeneration

Eventhough the tree is shade tolerant, seedlings established in natural forests thrive better in the presence of over-head light and free growing space. Draught, frost and fire adversely affects the seedlings in natural conditons, eventhough the incidence of such factors are almost unknown in their natural habitats. Coppicing power of the species depends upon environmental factors (Luna, 1996), varietal differences and also light availability (Kadambi, 1956).

To regenerate the tree artificially, seeds can be collected mostly during July to September, eventhough the seeding period of the species is quite irregular. Ripened and fallen fruits can be collected, dried in sun till they dehisce and the seeds gathered. Due to the oil content of seeds, they are to be sown within few days after collection (FRI, 1975). One kilogram of seeds contain about 280-500 numbers and the germination capacity of seeds vary from 70-95 percent. The seeds can be sown in shaded nursery beds prepared in open places and they are to be placed edge to edge, 7.5 cm x 7.5 cm apart, at a depth equal to the diameter of the seed and covered with a thin layer of soil. Germination will start within 2 weeks after sowing and most of the seeds will germinate within 2 months. The seedlings remain cotyledonary for fairly long time and the plant percent reported is 46-70. The seedlings can be either retained in the nursery beds or pricked into polythene bags and field planted during the North-East monsoon. Direct sowing by dibbling

method has also been reported to be successful in Kerala conditions (Luna, 1996).

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- Kostermans, A.J.G.H. 1980. Family *Clusiaceae*. In: M.D. Dassanayake and F.R. Fosberg (ed.) *Revised Handbook to the Flora of Ceylon*. vol. 1. Oxford & IBH, New Delhi. pp. 72-110.
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- Luna, R. K. 1996. *Plantation Trees*. International Book Distributors, Dehra Dun. pp. 495-496.
- Nambiar, V.P.K., N. Sasidharan, C. Renuka and M. Balagopalan. 1985. The Medicinal Plants of Kerala Forests. *KFRI Research Report No. 42*. KFRI, Peechi. p. 12.
- Stevens, P.F. 1986. *Mesua ferrea* became *M. nagassariurn* but has to be called *M. ferrea* again. *Taxon* 35: 352-354.

## 94. MIMUSOPS ELENGI L. ( Sapotaceae )

### Nomenclature

*Mimusops elengi* L., Sp. Pl. 349. 1753; Wt., Ic. Pl. Ind. Orient. t. 1586. 1850; Bedd., Fl. Sylvat. South. India t. 40. 1870; Clarke in Hook.f., Fl. Brit. India 3: 548. 1882; Bourd., For. Trees Trav. 212. 1908; Rama Rao, Fl. Pl. Trav. 238. 1914; Gamble, Fl. Presid. Madras 2: 765. 1921; van Royen, Blumea 6: 594. 1952; Oza, J. Bombay nat. Hist. Soc. 72: 601. 1975; Nicol. *et al.*, Intrap. Hort. Malab. 238. 1988; Krishnam., Min. For. Prod. India 15, 139, 213, 302, 354. 1993.

*Mimusops parviflora* R. Br., Prodr. 531. 1810; Lam., Bull. Jard. Bot. Bzg. ser. 3, 7: 235. 1925.

### Local

Elengi.

## Description

**Trees**, 20-25 m high; **branchlets** short, glabrous. **Leaves** simple, alternate, 4-11 x 3-6 cm, elliptic-ovate or lanceolate, subcoriaceous, glabrous, acute to attenuate at base, acute or acuminate at apex; **petioles** 3-4 cm long, glabrous. **Flowers** dull-white or greyish-white, fragrant, upto 1 cm across, solitary or in few-flowered fascicles in the upper axils; **pedicels** upto 1.5 cm long, appressedly pubescent, often deflexed; **calyx** with 8 sepals in two rows of 4 each, upto 0.8 x 0.3 cm, linear-lanceolate, acute at apex; **corolla** 24 lobed in 3 rows of 8 each, each upto 0.7 x 0.2 cm, acuminate at apex; **stamens** 8, alternate to petaloid staminodes, with filaments upto 0.1 cm long and oblong anthers upto 0.3 cm long and cordate at base; **pistil** with subglobose, appressed-pubescent, 6-8 locular ovary, 0.3-0.4 cm long, grooved style and columnar, fimbriate stigma. **Berries** yellow, upto 1.5 cm across, ovoid; **seeds** black, shiny, oblong, compressed (Fig. 30).



Fig. 30. *Mimosaops elengi* L.

## Ecology

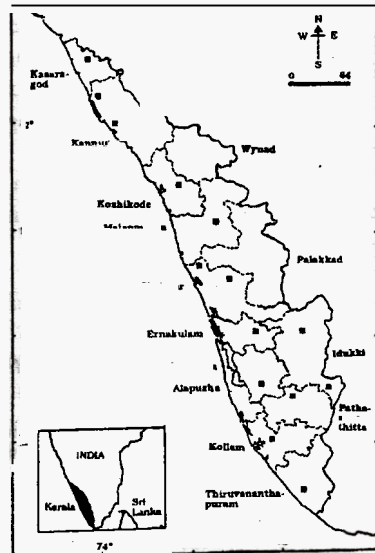
Graceful trees with dense crown, rather rare in moist deciduous forests, forest plantations, sacred groves, etc., flowering profusely during December to February and bearing mature fruits by August-September.

## Distribution

### Kerala

Kasaragod, Cannanore, Calicut, Malappuram, Trichur, Ernakulam, Idukki, Kottayam, Pathanamthitta, Quilon and Trivandrum districts; almost throughout the State, more common in low and midlands. Occasionally cultivated (Map 94).

India, Sri Lanka, Malaysia, Indonesia



Map 94.1 Distribution of *Mimosaops elengi* L. in Kerala

### Notes

*Mimusops elengi* L. var. *typica*, var. *parviflora* (R.Br.) Lam, var. *brevifolia* Lam and the forma *longipedunculata* (BI.) Lam under typical variety are all considered only as inseparable variants of one and the same species (Oza, 1975) as against Lam (1925) who considered them as distinct taxa.

### Products and uses

The tree yields a gum and its fragrant flowers are used in the perfume industry. Ripe fruits are edible and kernels of seeds contain 16.25% of fatty oil, useful for edible purposes and as an illuminant (Krishnamurthy, 1993). The fat-free seed-meal also contains 2-4% of Basic acid. Moss (1977) has reported that the flowers and fruits of the tree are medicinal as astringent. The fruit-pulp is also reported to be medicinal against dysentery. The flowers yield an essential oil, which along with sandal wood oil, produce a sweet-scented Attar (Krishnamurthy, 1993). It is also a source of brown dye.

### Regeneration

This fairly shade tolerant tree grows better in direct sunlight. Also, natural regeneration of the species depends on light availability. In canopy openings, it regenerates well whereas under shade and overhead canopy, seedlings suffer from heavy mortality.

Artificial regeneration of the species is through seeds which are available during August to September. About 600 fruits contain about 2150 seeds which weigh one kilogram (Sengupta, 1937). Usually seeds are sown singly on nursery beds, in baskets or other containers filled with soil. The seedlings can be field planted during rainy season, only after 2 years of growth when they attain sufficient size. It takes about 90 days for the seeds to germinate (Krishnaswamy, 1955). In general, growth of cultivated trees are rather slow (FRI, 1985), especially during initial few years.

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Sengupta, J.N. 1937. Seed weights, plant percent, etc for forest plants in India. *Indian Forest Records- New Series 2(5) Silviculture*. Manager of Publications, New Delhi.

**95. MUCUNA PRURIENS (L.) DC.**  
( **Papilionaceae** )

**Nomenclature**

*Mucuna pruriens* (L.) DC., Prodr. 2: 40.5. 182.5; Baker in Hookf., Fl. Brit. India 2: 187. 1876; Rama Rao, Fl. Pl. Trav. 118. 1914; Wilmot., Kew Bull. 42: 40. 1987; Nicol. *et al.*, Intrap. Hort. Malab. 138. 1988.

*Dolichos pruriens* L. in Stickm., Diss. Herb. Amb. 23. 1754.

*Stizolobium pruriens* (L.) Medic., Vorles Chrupfalz. Phys.-Ocon. Ges. 2: 339. 1787.

*Mucuna prurita* Hook., Bot. Misc. 2: 348. 1830 (*nom. superfl.*); Wt. *et* Arn., Prodr. 255. 1834; Gamble, Fl. Presid. Madras I: 356. 1918.

*Carpopogon pruriens* (L.) Roxb. (Hort. Beng. 54. 1814, *nom. nud.*) Fl. Indica 3: 283. 1832.

*Mucuna utilis* Wall. ex Wt., Ic. Pl. Ind. Orient. t. 280. 1838.

**Local name(s)**

Naicornam. Naicornam.

**Description**

Twining or climbing **undershrubs**, upto 4 m long, with perennial rootstock; **branchlets** wiry, hairy. **Leaves**, alternate, trifoliolate, 5-10 cm long, appressed silky hairy; **leaflets** 6.5-13.5 x 4-7.5 cm, terminal slightly smaller, rhomboid-ovate, entire, appressed hairy beneath, pubescent above, cuneate or truncate at base, subacute or mucronate at apex; **petiolules** 0.2-0.3 cm long, stout. **Flowers** purplish in 10-30 cm long racemes, solitary or 2-3 together on the silky-hairy rachis; **pedicels** 0.2-0.4 cm long, hairy; **calyx** upto 1 cm long, campanulate, hairy, toothed, with the upper teeth connate into a triangular lip and the lateral and lower teeth lanceolate, equal or slightly longer than the tube; **corolla** upto 4 cm long, with the standard petal folded, auricled at the base and keel petals slightly incurved at apex. **Pods** upto 7 x 1.5 cm, falcately curved and more or less S-shaped, densely pale white hairy; **seeds** 5-6 in a pod, upto 0.5 cm long with short hilum.

**Ecology**

Twiners with hairy stem causing irritation, often climbing on hedges in disturbed and dry areas of deciduous forests, wastelands, homesteads, sacred groves, etc. Flowers during November to January and fruits mature by March-

April. When touched, the hairs on the fruits are released which on falling on the body cause very severe and prolonged irritation to the skin.

**Distribution**

**Kerala**

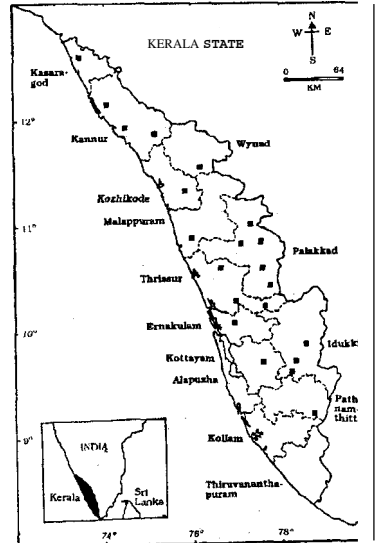
Kasaragod, Cannanore, Wynad, Calicut, Malappuram, Palghat, Trichur, Ernakulam, Idukki, Kottayam and Pathanamthitta districts; almost throughout the State (Map 95).

**World**

Tropics.

**Notes**

*Mucuna utilis* Wall. ex Wt., given as a synonym of *M. pruriens* (L.) DC. here, is also considered as a form or variety of the latter species by Backer and Bakhuizen (1963) and Wilmot-Dear (1987). The taxonomic difference to distinguish this infraspecific variant is mainly the hairy fruits, whereas vegetative characters are the same for the species proper also.



Map 95. Distribution of *Mucuna pruriens* (L.) DC. in Kerala.

**Products and uses**

Seeds, roots and hairs on the fruits of this plant are medicinal and therefore extracted. The roots are mainly used as a tonic and in the treatment of nervous disorders. Ointment made from roots is advocated against elephantiasis and leaves are curative of ulcers. Irritating hairs covering the fruits are used against diseases of gall and liver bladder (Nambiar, *et al.* 1985).

**Production and marketing**

The endosperm part of the seeds and the roots of the plant are the major useful items of non-wood products collected and marketed. From the State forests, the quantity of the item received by the Kerala State SC & ST Federation during 1994-95 to 1996-97 is not available in their records, eventhough the procurement and selling price of the item is noted to be Rs. 9.50 and Rs. 10.00per kg, respectively.

**References cited**

Backer, C.A and R.C. Bakhuizen van den Brink 1963. *Flora of Java*. vol. 1. Noordhoff-Groninger, The Netherlands. p. 629.

- Kerala State SC & ST Federation 1998. Different items of LFPP handled during 1994-95 to 1996-97 and price fixed by MFP Committee per kilogram for 1997-98. Invandum (unpublished)
- Nambiar, V.P.K., N. Sasidharan, C. Renuka and M. Balagopalan. 1985. Medicinal Plants of Kerala Forests. *KFRI Research Report No.42*. KFRI, Peechi. p. 49.
- Wilmot-Deane, C.M. 1987. Revision of *Mucuna* (Leguminosae-Phaseolae) in the Indian subcontinent and Burma. *Kew Bull.* 42: 23-46.

**96. MYRISTICA MALABARICA LAMK.**  
( Myristicaceae )

**Nomenclature**

*Myristica malabarica* Lamk., Hist. Acad. Roy. Sci. Mem. Math. Phys. Paris 162. 1791; Bedd., Fl. Sylvat. South. India t. 269. 1872; Hook.f. in Hook.f., Fl. Brit. India 5: 103. 1866; Bourd., For. Trees Trav. 259. 1908; Rama Rao, Fl. Pi. Trav. 339. 1914; Gamble, Fl. Presid. Madras 2: 1213. 1925; Sinclair, Gard. Bull. Singapore 23: 168. t. 9. 1968; Nicol. *et al.*, Intrap. Hort. Malab. 190. 1988; Krishnam., Min. For. Prod. India 302. 1993.

**Local name(s)**

Kattu-jathika, Panampalka, Pathiri-poov, Ponnampoo.

**Description**

Trees upto 15-25 m high; **bark** greenish-black, red inside with a red exudation; **branchlets** glabrescent. **Leaves** simple, alternate, 8-20 x 2.5-5 cm, oblong or elliptic-lanceolate, glabrous above, glaucous beneath, coriaceous, obtuse or narrowed at base, obtusely acute at apex; **petioles** upto 1.5 cm long, stout. **Flowers** yellow, unisexual in axillary pedunculate, dichasial cymes; **perianth** 3-lobed with lobes upto 0.4 cm long, ovoid, subglabrous; **stamens** 12-30 in a stalked column of united filaments produced above the elongate anthers; **pistil** with ovoid ovary and sessile, 2-lobed stigma. **Capsules** yellow, 5-9 x 4-5.5, cm, oblong, densely deciduous tomentose; **seeds** arillate, upto 2 cm long, ovoid with reddish-yellow, irregularly lobed, aril extending to the apex of seeds.

**Ecology**

An evergreen tree with straight, dark-brown trunk, dense foliage and almost regular branching pattern, fairly common in the semi-evergreen and evergreen forests and in specialised formations called Myristica swamps. Flowers mostly during February-March and fruits ripen by December-January.

**Distribution**

**Kerala**

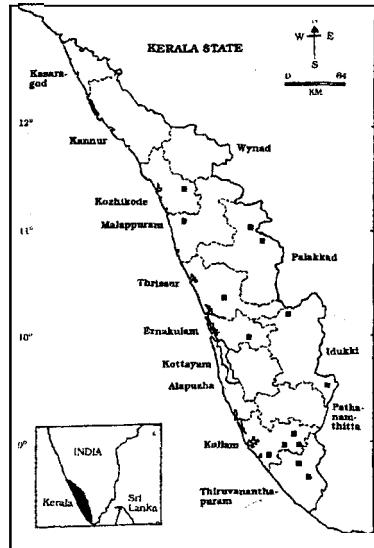
Calicut, Malappuram, Palghat, Trichur, Ernakulam, Idukki, Quilon and Trivandrum districts; almost throughout the State, from mid to the highlands (Map 96).

**World**

Peninsular India, Sri Lanka.

**Products and uses**

The seeds and their aril cover are used both as medicine and condiment. Also, the bark of the tree yields gum (Anonymous, 1962). Fat from the seeds is used as an embrocation in rheumatism, sores and pain and is also an illuminant (Krishnamurthy, 1993). Seed kernels contain a resin which is phenolic in nature and can be used as an antioxidant for the protection of oils and fats.



Map 96 Distribution of *Myristica malabarica* Lamk in Kerala

Ripe fruits of the plant is the same as Bombay nut-meg and Bombay mace (Anonymous, 1962) forming adulterants of the true nut-meg and mace produced by *Myristica fragrans* Houtt. trees.

**References cited**

Anonymous, 1962. *The Wealth of India: Raw Materials*. vol. 6. CSIR, New Delhi. p. 419.  
 Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi. p. 302.

**97. NERVILIA ARAGOANA GAUD.  
 ( Orchidaceae )**

**Nomenclature**

*Nervilia aragoana* Gaud., Bot. Voy. Freyc. 422, t. 36. 1826; Fisch. in Gamble, Fl. Presid. Madras 3: 1459. 1928; Abr. et Vatsl., Introd. Orch. 431. 1981.  
*Pogonia flabelliformis* Wall. (Cat. 7400. 1832, nom. nud.) ex Lindl., Gen. Sp. Orch. 415. 1835; Hook.f. in Hook.f., Fl. Brit. India 6: 121.  
*Nervilia carinata* Wt., Ic. Pl. Ind. Orient. 5 (1): t. 1720. 1852.



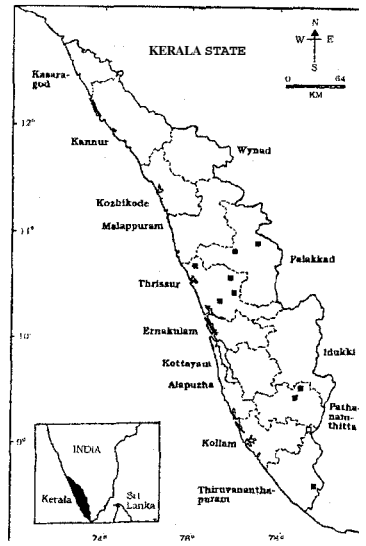
*Pogonia scottii* Reichb. f., Flora 276. 1872; Hook.f.in Hook.f., Fl. Brit. India 6: 120. 1890 & in Ann. Roy. bot. Gardn. Calcutta 5: 62. t. 93. 1895.  
*Nervilia scottii* (Reichb.f.) Schltr., Rot. Jahrb. 45: 404. 1911.

### Local name(s)

Kal-thamara, Orila-thamara.

### Description

**Herbs**, stoloniferous and tuberous; **tubers** white, 1.5-2cm across, subglobose, obscurely lobed. **Leaves** arising from the tuber after the flowers, erect with the lamina 8-12 x 7-10 cm, cordate, broadly ovate or almost orbicular, glabrous, entire, dark green above, pale green below, acute, acuminate or apiculate at apex with upto 18 nerves; **petioles** purple turning light green with purple lines, 8-20 cm long, glabrous. **Flowers** greenish-yellow, drooping, shortly stalked, in 10-25 cm high, racemose scapes; **sheaths** white with brown streaks, upto 2 cm long, acute at apex, the lower one loose and the upper one closely fitting around the peduncle; **pedicels** upto 0.3 cm long, green, curved; **bracts** light green, tinged with purple, upto 1.4 x 0.2 cm, linear-lanceolate, glabrous, subacuminate at apex; **calyx** with green or yellowish green sepals, 1.5-2.5 x 0.2-0.4 cm, oblanceolate, entire, glabrous, acute or subacute at apex and mid nerve subcarinate below; **corolla** with petals green, 1.4-2.5 x 0.2-0.4 cm, lanceolate, entire, glabrous, narrowed at base, acute at apex; **lip** white with pinkish veins, 1.5-2.4 cm long, obovate, 3-lobed, subsuccate, subclawed at base, with the lateral lobes upto 0.3 cm broad, parallel and embracing the column; **stamens** in a column, pale green, upto 1 cm long, dialated above, disposed at right angle to the ovary with pisticious anthers in two pollinia, white above and reddish towards base; **pistil** green often flushed with pink, upto 0.5 cm long, drooping, often winged along the edges, with broad, circular-trapezoid stigmatic surface; **seeds** minute.



Map 97. Distribution of *Nervilia aragoana* Gaud. in Kerala.

### Ecology

Mostly epiphyte on rocks, at the base of tree trunks, etc. where humus is accumulated. The species is mostly confined to evergreen forests in Kerala, even though it is also rarely seen in moist deciduous areas where humid

conditions prevail. Flowering during October to December and fruits are produced during February to May.

### Distribution

Kerala

Palghat, Trichur, Pathanamthitta, Quilon and Trivandrum districts; mainly form the mid to the highlands (Map 97).

World

India to Malesia and Samoa.

### Notes

While Santapau and Kapadia (1966) treated *Nervilia aragoana* and *Nervilia scottii* as conspecific, Hara, (1978) considered them as distinct species. The affinities of this species with *Nervilia carinata* have been well elucidated by Saldanha and Nicolson (1976). The conspecificity of the two taxa is accepted here, as has been justified by Santapau and Kapadia (1966). The local name Orila-thamara is also very commonly used for another species namely *Hybanthus enneaspermus* (L.) F. Muell. (Violaceae), which is also a medicinal herb.

### Products and uses

Leaves and tubers of this plant are collected for medicinal purposes. In Malaya (Anonymous, 1966), it has been reported that the decoction of leaves is used as a protective medicine after child birth.

### References cited

- Anonymous, 1966. *The Wealth of India: Raw Materials*. vol. 7. CSIR, New Delhi. p. 18.
- Hara, H. 1978. *An Enumeration of the Flowering Plants of Nepal*. vol. 1. Trustees, British Museum (Natural History) London. p. 50.
- Saldanha, C.J. and Dan H. Nicolson 1976. *Flora of Hassan District, Karnataka*. Oxford & IBH, New Delhi. p. 837.
- Santapau, H. and Z.A. Kapadia 1966. *The Orchids of Bombay*. Manager of Publications, New Delhi. p. 134.

## 98. NILGIRIANTHUS CILIATUS (NEES) BREMEK. ( Acanthaceae )

### Nomenclature

*Nilgirianthus ciliatus* (Nees) Bremek., Mat. Mon. Strob. 172. 1944; Sant., Bot. Mem. Univ. Bombay 2: 40. 1951.

*Strobilanthes ciliatus* Nees in Wall., Pl. As. Rar. 3: 85. 1832; Wt., Ic. Pl. Ind. Orient. t. 1517. 1850; Clarke in Hook.f., Fl. Brit. India 4: 439. 1884; Rama Rao, Fl. Pl. Trav. 302. 1914; Gamble, Fl. Presid. Madras 2: 1039. 1924.

### Local name(s)

Karim-kuringi.

### Description

**Undershrubs**, upto 1.2m high; **stem** and branches terete or subquadrangular, often winged or fimbriate at nodes. **Leaves** simple, opposite, 6-15 x 2.5-6 cm, lanceolate, serrate, glabrous or nearly so, lineolate, attenuated into the petiole at base, acuminate at apex; **petioles** upto 3 cm long or sometimes very short. **Flowers** white, pale-purple or white with reddish blotches in axillary, dense spikes, upto 2 cm long; **bracts** almost 0.5 cm long, ovate, subacute at apex; **calyx** almost 0.5 cm long, glandular hairy, tubular below, linear-segmented and glandular-ciliate above; **corolla** upto 2 cm long, tubular, narrowed towards base, swollen in the upper half, shortly oblong-rounded lobed; **stamens** 4, exserted, with bearded filaments for the longer ones and purple anthers; **pistil** with glabrous ovary, linear style and stigma of one linear branch, the other suppressed. **Capsules** upto 0.8 x 0.4 cm, oblong, apically ciliate, 2 or 4 seeded.

### Ecology

Forming part of the ground flora, the plant is common in the evergreen and semi-evergreen forests of Kerala, at higher elevations. Flowers during December to February and fruits mature by March-April.

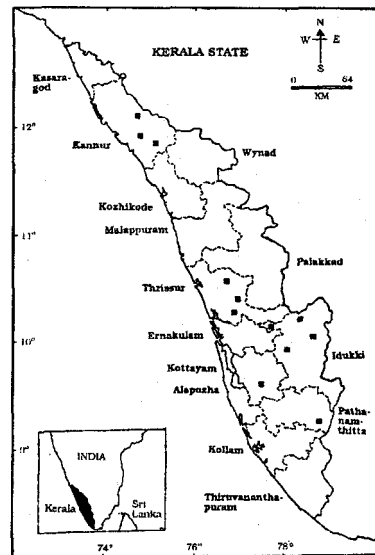
### Distribution

Kerala

Cannanore, Trichur, Idukki, Kottayam and Pathanamthitta districts; almost throughout the State, mainly in the hilly uplands and highlands (Map 98).

World

Southern Peninsular India.



Map 98 Distribution of *Nilgiranthus ciliatus* (Nees) Bremek in Kerala

### Notes

This medicinal plant of the forests of southern Western Ghats has not been included in the NWFP work of Krishnamurthy (1993).

### Products and uses

A medicinal shrub, the leaves, stems, roots and seeds of which are collected. They are used for the treatment of jaundice, dropsy, rheumatism, anasarca, urino-genital ailments, etc. (Nambiar, *et al.* 1985). Melhotra and Kundu (1962) have reported the use of the leaves of this plant against gout, lumbago and pain of joints. The use of the bark of the plant as an emollient has also been reported (Anonymous, 1976).

### Production and marketing

Large quantities of the root and basal stem portion of this medicinal plant is extracted from the natural forests of Kerala. However, the Kerala State SC & ST Federation (1998) had not recorded the exact quantity that they handled, even though the approximate cost of the item is reported to be around Rs. 7.00 per kg during 1994-95 to 1996-97.

### References cited

- Anonymous, 1976. *The Wealth of India: Raw Materials*. vol. 7. CSIR, New Delhi. p. 58.
- Kerala State SC & ST Federation 1998. Different items of LFPP handled during 1994-95 to 1996-97 and price fixed by MFP Committee per kilogram for 1997-98. Trivandrum (unpublished).
- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi.
- Melhotra, B.N. and B.C. Kundu 1962. Pharmacognostic studies on *Asteracantha longifolia* Nees. *Planta Medica* 10:414.
- Nambiar, V.P.K., N. Sasidharan, C. Renuka and M. Balagopalan. 1985. Medicinal Plants of Kerala Forests. *KFRI Research Report No.42*. KFRI, Peechi. p. 104.

## 99. NOTHAPODYTES NIMMONIANA (GRAH.) MABBER. (Icacinaceae)

### Nomenclature

- Nothapodytes nimmoniana* (Grah.) Mabber., Bot. Hist. Hort. Malab. 88. 1980.
- Premna nimmoniana* Grah., Cat. Bombay Pl. 155. 1839.
- Nothapodytes foetida* (Wt.) Sleum., Notizhl. Gart. Berl. Dahl. 15:247. 1940; Sleum., Blumea 17:232-233. 1969.
- Mappia foetida* (Wt.) Miers, Mag. Nat. Hist. Ser. 2,9: 395. 1852; Bedd., Fl. Sylvat. South. India 140. 1872; Mast. in Hook.f., Fl. Brit. India 1:589. 1875; Bourd., For. Trees Trav. 86. 1908; Rama Rao, Fl. Pl. Trav. 80. 1914; Gamble, Fl. Presid. Madras 1: 196. 1915.
- Mappia ovata* Miers, Ann. Mag. Nat. Hist. 2: 396. 1852.

**Local name(s)**

Chorla. Pinari.

**Description**

**Shrubs** or **trees** upto 2-7.5 m high; **branchlets**, slender, woody, prominently lenticellate. **Leaves** simple, alternate, upto 17 x 9 cm, broadly ovate or elliptic, tomentose along the veins beneath, glabrous above, unequal sided at base, acute or acuminate at apex with 8-10 pairs of lateral nerves; **petioles** upto 6 cm long. **Flowers** greenish-white, upto 0.6 cm long, creamy yellow with a foul smell, in terminal corymbose cymes or panicles; **pedicels** and peduncles hairy; **calyx** 5 toothed; **corolla** with 5 petals, connate, villous within and inflexed at apex; **stamens** 5, slightly exserted with oblong or roundish, dorsifixed anthers; **pistil** with one-loculed ovary and thick stigma. **Drupes** reddish purple, upto 2 cm long, oblong, compressed, 1-seeded.

**Ecology**

A tree of moderate size abundant in the evergreen forests and sacred groves, especially in shade. Flowers are produced during June to August and fruits ripen during September-October, and may extend to January.

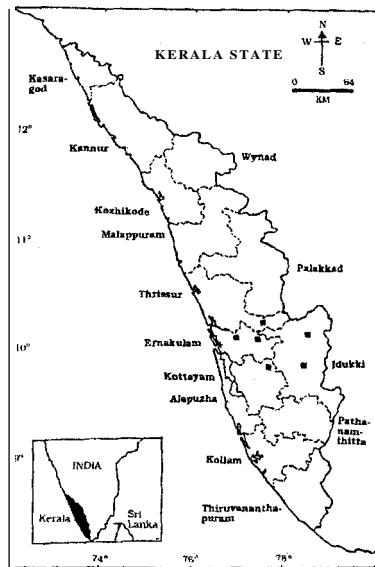
**Distribution**

Kerala

Trichur, Ernakulam, Idukki and Kottayam districts; mainly in the hilly uplands and highlands (Map 99).

World

India, Sri Lanka, Thailand, Indo-China, China, Malesia.



Map 99. Distribution of *Nothapodytes nimmoniana* (Garh.) Mabber. in Kerala.

**Notes**

In almost all Indian Floras, this plant goes under the generic name *Mappia* Jacq. Sleumer (1969) had shown that *Mappia* is a genus confined to American continent and that plants going under that name in the Asian continent belongs to the genus *Nothapodytes*. The species is an addition to Krishnamurthy (1993).

**Products and uses**

Fruits are edible and are similar to that of *Syzygium cumini* (L.) Skeels in appearance and taste. Seeds of the plant yield about 48% of an oil, brownish in colour and poorly fluorescent (Anonymous, 1962).

### Production and marketing

The product extracted from *N. nimmoniana* growing in the the natural forests of the State, is the seeds. It is marketed as a medicinal item and the Kerala State SC & ST Federation (1988) received about 4339 kg of it through its various collection centres during 1994-95 to 1996-97. The cost of the product was fixed as Rs. 10.00 per kilogram during 1996-97.

### References cited

- Anonymous, 1962. *The Wealth of India: Raw Materials*. vol. 6. CSIR, New Delhi. p. 302.
- Kerala State SC & ST Federation 1998. Different items of LFPP handled during 1994-95 to 1996-97 and price fixed by MFP Committee per kilogram for 1997-98. Trivandrum (unpublished).
- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi.
- Sleumer, H. 1969. Materials towards the knowledge of Icacinaeae of Asia, Malesia and adjacent areas. *Blumea* 17: 181-224.

## 100. OCHLANDRA BEDDOMEI GAMBLE ( Bambusaceae )

### Nomenclature

*Ochlandra beddomei* Gamble, Ann. Roy. bot. Gardn. Calcutta 7: 124. 1896 & in Hook.f., Fl. Brit. India 7: 419. 1897; Rama Rao, Fl. Pl. Trav. 448. 1914; Fisch. in Gamble, Fl. Presid. Madras 3: 1863. 1934; Varm. *et* Bah., Indian For. Rec. (n.s.) Bot. 6(1): 3. 1980; Tew., Monogr. Bamb. 115. 1992; Kumar, Rheedia 4(1): 25. 1994 & *ibid.* 5(1): 66. fig. 1 (A-L). 1995.

### Local name(s)

Not known.

### Description

Tufted, erect, bamboos, 10-12 m high; **culms** upto 4 cm in diameter with internodes 15-17 cm long; **nodes** sparsely and pubescent; **culm-sheath** upto 11 x 3.5 cm, oblong-obtuse, glabrous with a short, lanceolate blade, progressively smaller towards the culm apex, deciduous. **Leaves** 10-14 x 1.5-2.5 cm, narrowly elliptic-lanceolate, smooth above, glaucous below, rounded or slightly cuneate at base, long-acuminate with a twisted, setaceous tip, with margins cartilaginous, revolute, scabrid and secondary veins about 8 pairs with a few intermediates; **petiole** 0.2-0.5 cm long; **sheaths** auricled and bristled; **ligules** very narrow. **Flowers** (spikelets) clustered, 2-3.5 cm long, subcylindric, in terminal spicate panicles on leafy branches or on leafless

nodes, covered with scattered, stiff, bulbous-based, brown hairs; **glumes** 2-4, 2 sterile ovate, often long-mucronate at apex; fertile glume upto 2.8 cm long, ovate-lanceolate, mucronate, many-nerved, glabrous; **palea** membranous, 2.6 cm long, lanceolate, subobtuse, shorter than the fertile glume; **stamens** many, exserted with filaments free and anthers narrow, 1.2-1.6 cm long, bifid and mucronate at apex; **pistil** with ovary suborbicular with the beak of the perigynium produced in to an angular styler sheath, glabrous with 6, plumose, white stigma. **Caryopsis** almost 5 x 1.7 cm, supported by the persistent glumes.

**Ecology**

A very rare bamboo in the moist deciduous forests of Kerala. Flowering of the species was reported during 1875-76 (Gamble, 1896) and recently Kumar (1995) recorded flowering in 1986, 1988 and 1992.

**Distribution**

Kerala

Wynad; reported only from Thariodu area in the highlands of the District (Map 100).

World

Southern Peninsular India in the Western Ghats.

**Notes**

An endemic and endangered, but useful bamboo species of Kerala, not enumerated in Krishnamurthy's (1993) work.

**Products and uses**

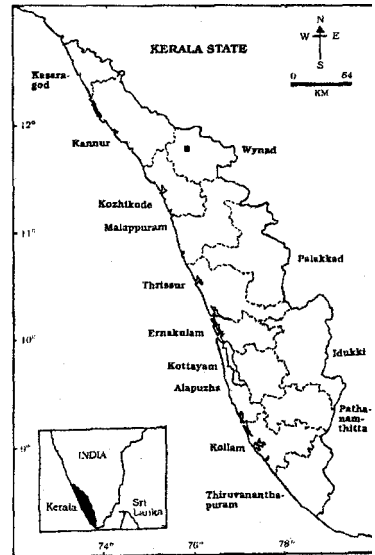
Culms are used for making baskets.

**References cited**

Gamble, J.S. 1896. Bambuseae of British India. *Ann. Roy. bot. Gardn. Calcutta* 7: 1-133.

Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi.

Kumar, Muktesh 1995. A re-investigation on the taxonomy of the genus *Ochlandra* Thw. (Poaceae-Bambusoideae). *Rheedea* 5(1):



Map 100 Distribution of *Ochlandra beddomei* Gamble in Kerala

**101. OCHLANDRA EBRACTEATA RAIZ. ET CHATT.**  
(Bambusaceae)

**Nomenclature**

*Ochlandra ebracteata* Raiz. et Chatt., Indian For. 89: 362. 1963; Varm. et Bah., Indian For. Rec. (n.s.) Bot. 6(1): 3. 1980; Tew., Monogr. Bamb. 110. 1992; Kumar, Rheedia 5(1): 68-70, fig. 2 (A-K). 1995.

**Local name(s)**

Vella-eeta.

**Description**

Shrubby or arborescent bamboos, upto 4.5 m high; **culms** 2-3.5 cm in diameter with shining green nodes and internodes almost 45 cm long; **culm-sheaths** 13-15 x 6-11 cm, ovate-obtuse, covered with appressed, subulate, chocolate-brown or black, hairs; **ligules** 0.5-0.8 cm long. **Leaves** 10-50 x 6-12 cm, oblong-lanceolate, glabrous on both sides, margins and apices scabrid, shortly cuneate at base, acuminate at apex; **petioles** 0.2-1 cm long, thick and broad, often twisted; secondary veins 10-15 pairs, intermediates 6-8 with numerous transverse veinlets; **sheaths** ciliate-auricled, striate, glabrous; **ligules** 0.2-0.4 cm long. **Flowers** (spikelets) green, 3-3.5 x 0.5-0.7 cm, cylindro-conical in flagellate, spicate panicles of verticillate clusters with sessile and comparatively large fertile spikelets mixed; **glumes** sterile 4, 0.6-1.3 cm in flowers and fertile glumes upto 1.7 cm long in flowers, 2.5-3 cm in fruits; **palea** upto 1.4 cm long in flowers; **stamens** numerous with fused filaments and anthers 1-1.5 cm long; **pistil** with ovary very small, dorsally compressed, somewhat spherical and stigma 7-9 branched, plumose. **Caryopsis** upto 6 x 1.5 cm, light chocolate-brown coloured, oblong, beaked.

**Ecology**

Very rare, along stream sides in moist deciduous forests of South Kerala. Flowering has been reported during 1961, 1963, 1988, 1992 (Kumar, 1995), and 1993 (Seethalakshmi, 1993), either gregarious or sporadic, and the culms perish after the ripening of the grains. Ripened fruits are available by April.

**Distribution**

Kerala

Quilon and Trivandrum districts; mainly in the midlands, hilly uplands and highlands (Map 101).

World

Southern Peninsular India, along the Western Ghats.



## Notes

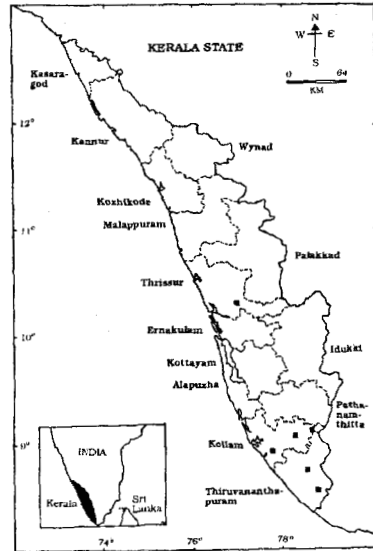
This bamboo, endemic and very rare, is grown in the Institute at its Field Station at Palapilly, Trichur District, Kerala. The species is not included in the work of Krishnamurthy (1993).

## Products and uses

Culms and grains are useful. The culms are used in paper pulp industry and also for basket making and mat weaving. Dried seeds are powdered and used as cattle feed,

## Regeneration

The bamboo regenerates well in the natural conditions after gregarious flowering and fruiting that take place occasionally or once in six months as observed by local people (Seethalakshmi and Muktheshkumar, 1998). The dispersed seeds germinate during the first monsoon, after April-May when fruiting usually occurs.



Map 101. Distribution of *Ochlandra ebracteata* Raiz. et Chatt. in Kerala.

For artificial regeneration of the species, seeds collected from natural strands can be sown on raised nursery beds, covered with soil-sand mixture. Germination starts by about 3 days and will be completed within 10 days. Germination rate of seeds vary from 57-73% when fresh and after a storage of about 3 months, the rate may come down to 4% (Seethalakshmi, 1993). Rhizome can also be used for multiplication of the species, which are to be planted by the onset of monsoon. Culm-cuttings treated with growth promoting substance also root (Seethalakshmi and Muktheshkumar, 1998) and establish.

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- Seethalakshmi, K.K. 1993. Flowering and fruiting of Reed-bamboos in Kerala. *BIC-India Bull.* 3(2): 37-41.
- Seethalakshmi, K.K and M.S. Muktheshkumar 1998. *Bamboos of India: A Compendium*. INBAR, Beijing and KFRI, Peechi. pp. 180-182.

**102. OCHLANDRA SCRIPTORIA (DENNST.) FISCH.**  
(**Bambusaceae**)

**Nomenclature**

*Ochlandrascriptoria* (Dennst.) Fisch. in Gamble, Fl. Presid. Madras 3: 1863. 1934; Varm. et Bah., Indian For. Rec. (n.s.) Bot. 6(1): 3. 1980; Tew., Monogr. Bamb. 110. fig. 1-3. 1992.

*Bambusa scriptoria* Dennst., Schul. zum Hort. Malab. 31. 1818.

*Bheesa rheedii* Kunth, Enum. Pl. 1: 434. 1822.

*Ochlandra rheedii* (Kunth) Benth. et Hook.f. ex Gamble, Ann. Roy. bot. Gardn. Calcutta 7: 121. 1896 & in Hook.f., Fl. Brit. India 7: 418. 1897; Bedd., For. Trees Trav. 403. 1908; Rama Rao, Fl. Pl. Trav. 448. 1914.

**Local name(s)**

Ama, Kolangi, Ottal.

**Description**

Shurby, gregarious, reed-like bamboos, upto 4 m high; **culms** upto 2.5 cm in diameter, smooth with somewhat raised nodes and internodes upto 25 cm long; **culm-sheaths** thin, truncate with 2 falcate, long-ciliate auricles and 10-15 cm long, cusiform, purplish persistent blades. **Leaves** 10-25 x 1-3 cm, linear-lanceolate, smooth and glabrous, rounded at base, acuminate and ending in a scabrous point at apex; **petioles** and **ligules** very short. **Flowers** (spikelets), upto 2 cm long, cylindric, acute, glabrous in short, terminal or axillary, leafy, spicate panicles; **glumes** sterile ones in heads, smaller, almost 1.5 cm long and fertile few, upto 2 cm long, subsolitary; **paleas** almost 2 cm long, convolute, not keeled; **stamens** 15-20 or more, exserted, with slender, free filaments and mucronate anthers; **pistil** with oblong ovary, surmounted by perigynium enclosing the style with 3 plumose stigma. **Caryopsis** upto 7.5 cm long, beaked upto 1.2 cm long.

**Ecology**

Gregarious small bamboos, forming thick clumps, confined to canal, stream and river banks, both in forest and non-forest areas, mostly at low elevations, with copious culm formation. The species is reported to sporadically flower almost every year and Kumar (1995) has reported the reed-bamboo in flowers and fruits during 1988, 1990 and 1992. The flowering of the species is reported to be during February to May in South Kerala (Mohan and Henry, 1994) and during March to August in North Kerala (Ramachandran and Nair, 1988). Even though the culms are reported to be growing after flowering and fruiting, Seethalakshmi (1993) notes that they gradually dry after fruit dispersal.

**Distribution**

Kerala

Cannanore, Wynad, Calicut, Palghat, Ernakulam, Idukki and Trivandrum districts; almost throughout the State (Map 102).

World

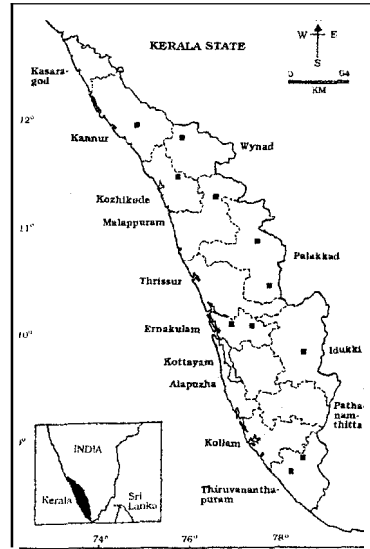
Endemic to Peninsular India.

**Notes**

This is a very useful bamboo species, occurring within and outside the forests of Kerala. However, the species has not been included in the work of Krishnamurthy (1993).

**Products and uses**

This slender but strong bamboo is used in the manufacture of mats, baskets, fish-traps, floats and for roofings huts. In harbours, the culms are made into bundles and used as floating-fenders and as rafts (Anonymous, 1952). Bamboo boards are also prepared from this reed-bamboo. When available in plenty, the species is also exploited for pulp industry. Flutes are also made of the culms of this species. As a soil-binder, the bamboo is often planted along the bunds of paddy fields in Kerala (Rama Rao, 1914).



Map 102. Distribution of *Ochlandra scriptoria* (Dennst.) Fisch. in Kerala.

**Regeneration**

Natural regeneration of the reed is from seeds. They are usually dispersed during April-May, reported to be annual but not very frequent (Seethalakshmi and Muktheshkumar, 1998). The parent culms dry and perish after flowering and fruiting.

Seeds collected from natural strands can be used for the artificial regeneration of the bamboo. Viability of the seeds is only about 2 months. They can be sown on nursery beds prepared with sand and soil mixture and partially shaded for about two months. Germination takes place within four days after sowing and about 70% seeds sprout. The seedlings can be field-planted after a year of growth in the nursery. Also, planting of rhizomes and rooted cuttings prepared using growth promoting substances can also be done (Seethalakshmi, et al. 1990) to artificially regenerate the species.

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- Rao, M. Rama, 1914. *Flowering Plants of Travancore*. Govt. Press, Trivandrum p. 448.
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**103. OCHLANDRA SIVAGIRIANA (GAMBLE) CAMUS  
( Bambusaceae )**

**Nomenclature**

*Ochlandra sivagiriana* (Gamble) Camus, Les Bamb. 181. 1913; Varm. *et* Bah., Indian For. Rec. (ns.) Bot. 6(1): 3. 1980; Tew., Monogr. Bamb. 113. 1992; Kumar, *Rheedea* 5(1): 74-76. fig. 5. 1995.

*Ochlandra rheedii* (Kunth) Benth. var. *sivagiriana* Gamble, Ann. Roy. bot. Gardn. Calcutta 7: 122. 1896(*non* Talb.); Bourd., For. Trees Trav. 403. 1908; Fisch. in Gamble, Fl. Presid. Madras 3: 1863. 1934.

**Local name(s)**

Not known.

**Description**

Straggling bamboos, upto 5 m high; **culms** with nodes somewhat raised, internodes upto 36 cm long and about 1.8 cm in diameter; **culm-sheaths** upto 18 cm long, striate when old. **Leaves** 8-22 x 1-2.5 cm, linear-lanceolate, glabrous, attenuate at base, acuminate at apex; **petioles** 0.2-0.4 cm long, sheaths smooth, glabrous, with two falcate auricles, fringed with deciduous bristles; **ligules** very short. **Flowers** (spikelets) upto 4 x 0.5 cm,

cylindric, acute, slightly hairy, few, in terminal or axillary spicate panicles on leafy branchlets; **glumes** 2 sterile, about 2 cm long, many-nerved, acuminate at the tip; **fertile glumes** almost 3 cm long, many-veined; **paleas** about 3 cm long, convolute, mucronate, membranaceous; **stamens** upto 60, exerted with free filaments and slightly apiculate anthers; **pistil** with oblong ovary, surmounted by perigynium enclosing the style and 5, plumose stigmas.

**Ecology**

Very rare, in moist deciduous and semi-evergreen forests at medium elevations (Vazhachal) in Kerala. Flowering of the species was reported for the first time during 1993 (Kumar, 1993), after which the culms perished. Anonymous (1950) has recorded that this bamboo flowers annually.

**Distribution**

Kerala

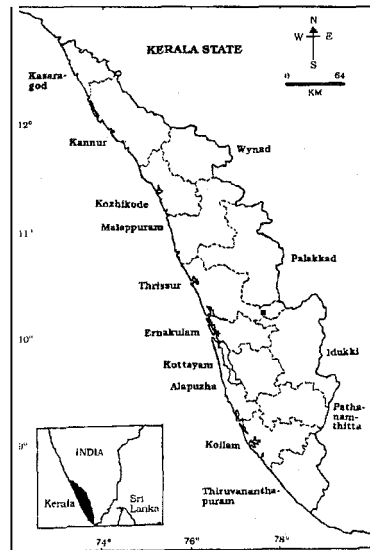
Trichur District at Vazhachal in the highlands (Map 103).

World

Peninsular India in the southern Western Ghats.

**Notes**

This species, which was originally considered a variety, ie. *Ochlandra rheedii* (Kunth) Benth. var. *sivagiriana* Gamble, is characterised by longer leaves and spikelets and more numerous stamens. Krishnamurthy (1993) has not included this species along with other useful bamboos in India.



Map 103 Distribution of *Ochlandra sivagiriana* (Gamble) Camus in Kerala

**Products and uses**

The mature culms are collected for making baskets and for tying. Fences are also made using the culms of this bamboo.

**References cited**

Anonymous, 1952. *The Wealth of India: Raw Materials*. vol. 2. CSIR, New Delhi. p. 12.  
 Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi.  
 Kumar, Muktesh 1995. A re-investigation on the taxonomy of the genus *Ochlandra* Thw. (Poaceae-Bambusoideae). *Rheedea* 5(1): 63-89.

**104. OCHLANDRA TRAVANCORICA (BEDD.) BENTH.**  
(Bambusaceae)

**Nomenclature**

*Ochlandra travancorica* (Bedd.) Benth. in Benth. *et* Hook.f., Gen. Pl. 3: 1215. 1883; Gamble, Ann. Roy. bot. Gardn. Calcutta 7: 125, pl. 111. 1898 & in Hook.f., Fl. Brit. India 7: 419. 1897; Bourd., For. Trees Trav. 403-404. 1908; Rama Rao, Fl. Pl. Trav. 448. 1914; Gamble, Fl. Presid. Madras 3: 1863-64. 1928; Varm. *et* Bah., Indian For. Rec. (n.s.) Bot. **6(1)**:4. 1980; Tew., Monogr. Bamb. 115. fig. 1-4. 1992; Krishnam., Min. For. Prod. India 480. 1993; Kumar, Rheedeia 5(1): 82-83, fig. 8 (A-L). 1995.

*Bheesa travancorica* Bedd., Fl. Sylvat. South. India 239. pl. 324. 1873.

**Local name(s)**

Eeetta, Kar-eeetta, Vei.

**Description**

Erect, shrubby, arborescent, reed-like, gregarious bambbos, 2-6 m high; **culms** greyish-green, rough, 2.5-5 cm in diameter with nodes somewhat swollen and marked with base of fallen sheaths and internodes 45-60 cm (sometimes even 1.5 cm) long, thin walled; **culm-sheaths** 15-20 cm long, thin, longitudinally wrinkled, striate, densely covered with appressed golden, subulate hairs, ciliate along the margins; **ligules** narrow, entire. **Leaves** 9-30 x 5-23 cm, broadly oblong-lanceolate, glabrous or slightly rough, edges scabrous, midrib prominent at the basal portion, unequally rounded at base, tapering upwards, setaceous at apex; **petioles** upto 1 cm long, thick, often concave; **sheaths** striate, glabrous, keeled, ciliate along the edges, ending in a smooth callus and shortly falcate, auricled with bristled mouth; **ligules** short, truncate. **Flowers** (spikelets) 3-4 x 0.8-1 cm, ovate or oblong-ovate, glabrous, striate, supported by 2-4 small sheathing bracts, in 12-15 cm long spicate panicles; **glumes** usually 3, sterile about 2 cm long, concave, ovate, truncate at the top and tipped with a subulate apex; **fertile glumes** about 3 cm long; **paleas** 1.5-2.2 cm long thin, acute; **stamens** upto 120, monadelphous, at first included and afterwards long exerted with

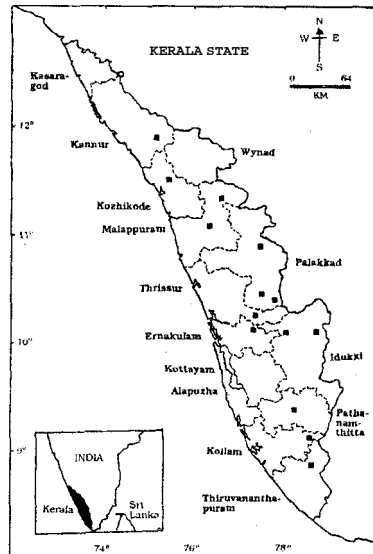


Map 104. Distribution of *Ochlandra travancorica* (Bedd.) Benth. in Kerala.

filaments slender and anthers almost 0.2 cm long, narrow, long, hairy, apiculate; **pistil** with ovary narrow, smooth, surmounted by tri or quadrangular perigynium enclosing the style and 5-6, plumose stigmas, spirally twisted together. **Caryopsis** brown, upto 7.5 x 2.5 cm, ovate-oblong with wrinkled, fleshy pericarp (Fig. 31).

## Ecology

This gregarious reed-like bamboo form part of the undergrowth in semi-evergreen and evergreen forests of Kerala, at low and medium elevations. They form impenetrable thickets also along stream banks, more commonly in the southern districts of the State. Gamble (1898) has recorded 7 year flowering cycle for the species and Kumar (1995) has noted gregarious flowering of the bamboo during 1868, 1875, 1882, 1905, 1976, 1988, 1992 and 1993, based on literature, herbarium and field records. Rama Rao (1914) reports the flowering period of this bamboo in Kerala as December-January and fruiting by February-March. According to Seethalakshmi (1993), who observed flowering of the species in Peerumedu and Kulathupuzha during 1992, fruit setting is very poor. After flowering the culms perish.



Map 104. Distribution of *Ochlandra travancorica* (Bedd.) Benth. in Kerala.

## Distribution

### Kerala

Cannanore, Calicut, Malappuram, Palghat, Ernakulam, Idukki, Pathanamthitta, Quilon and Trivandrum districts; almost throughout the State, in the hilly uplands and highlands (Map 104).

### World

Endemic to southern Peninsular India in the Western Ghats.

## Products and uses

The mature culms of this bamboo is mostly exploited for the manufacture of pulp and paper. Maximum yield of bleached pulp is about 45% (Krishnamurthy, 1993). The culms are also in very high demand for making mats, baskets and boards. It is also used for the construction of small houses. In match industry, the culms are used for the manufacture of splints and match-boxes (Anonymous, 1988). In agriculture, articles such as irrigation wheels, pipes, threshing boards, handles of hoes, rakes and such tools are

made of this bamboo. The bamboo is also planted along bunds of paddy fields as soil binder (Rama Rao, 1914).

### **Production and marketing**

Among Indian Bamboos. *O. travancorica* yield the maximum percentage of pulp, ie. about 48.3% (unbleached) and 45.8% (bleached) and the pulp is with largest fibre length and therefore is of high quality (Anonymous, 1952). From Kerala, about 25400 tonnes of the bamboo is extracted (Anonymous, 1952) annually. The product is not dealt with by the Kerala State SC & ST Federation (1998) and hence its value as a NWFP item is not known.

### **Regeneration**

Natural regeneration of the species is by seeds and rhizomes. Seeding takes place at a cycle of 7 years or sometimes at lesser intervals, as reported by Seethalakshmi and Mukthesh kumar (1998). Soon after dispersal, seeds germinate in natural conditions, and within 6-8 years, the full culm-size is attained.

For artificial regeneration of the species, seeds collected from natural stands, rhizomes and two-noded culm cuttings rooted by vegetative propagation methods can be used. Seedlings raised in nursery beds can be field-planted after a year of growth. Rhizomes separated from mother clumps and planted during the monsoon period will also sprout and grow without much casualty. Nursery seedlings and rooted cuttings give about 76 to 85 % survival. Philip and Chacko (1996) had also used tissue-culture raised-plants to propagate the reed using nodal vegetative buds. Also, Kumar (1990) has given a set of management strategies on the sustainable extraction of this natural resource, excessively exploited at present from the natural forests of Kerala.

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- Seethalakshmi, K.K. and M.S. Muktheshkumar. 1998. *Bamboos of India: A Compendium*. INBAR, Beijing and KFRI, Peechi. pp. 191-196.

**105. OCHLANDRA WIGHTII (MUNRO) FISCH.**  
( **Bambusaceae** )

**Nomenclature**

- Ochlandra wightii* (Munro) Fisch. in Gamble, Fl. Presid. Madras 3: 1864. 1934; Varm. et Bah., Indian For. Rec. (n.s.) Bot. 6(1): 4. 1980; Tew., Monogr. Bamb. 117. figs. 1-3. 1992; Kumar, *Rheedea* 5(1): 88. 1995.
- Bambusa wightii* Munro, J. Linn. Soc. London 26: 111. 1868.
- Ochlandra brandisii* Gamble, Ann. Roy. bot. Gardn. Calcutta 7: 126. 1896 & in Hook.f., Fl. Brit. India 7: 419. 1897; Bourd., For. Trees Trav. 405. 1908; Rama Rao, Fl. Pl. Trav. 448. 1914.

**Local name(s)**

Era-kalli.

**Description**

Erect, shrubby bamboos, forming clumps, upto 7 m high; **culms** 1.5-2 cm in diameter with nodes prominent by greyish bands on both sides and internodes upto 48 cm in length; **culm-sheaths** 8-15 cm long excluding the blade, 5 cm broad, covered with appressed, light brown subulate hairs. **Leaves** 18-36 x 3.5-7.5 cm, oblong-lanceolate, glabrous on both surfaces, whitish beneath, margins cartilaginous, smooth, mid-vein prominent, attenuate at base, acuminate at apex; **ligules** very long. **Flowers** (spikelets), upto 2.5 x 0.5 cm, conical, in terminal, verticillate spikes with thick, glabrous rachis; **glumes** 4 sterile, basal, upto 2 cm long, outer two thicker and ovate-truncate with a subulate point and the inner two ovate-acute, mucronate; **fertile glumes** 1.8 cm long, thin, membranous, many veined; **palea** almost 1.5 cm long, narrow; **stamens** upto 60 with filaments short at first and elongated later and anthers narrow, long, apiculate; **pistil** with ovary glabrous, perigynium thickened and enclosing the style with 5, plumose stigmas. **Caryopsis** 5.5 x 1.8 cm long, fleshy.

**Ecology**

Very rare in the semi-evergreen forests at fairly high altitudes. Flowers were reported during 1835 and 1882 (Gamble, 1896) and recently in 1992 at Achenkovil (Kumar, 1995). Bourdillon (1908) reports the flowering month of the species as February.

**Distribution**

Kerala

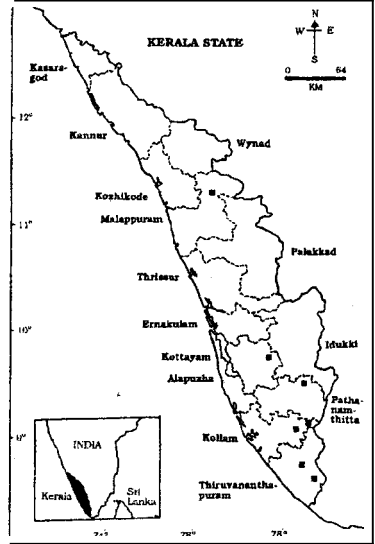
Malappuram, Kottayam, Pathanamthitta, Quilon and Trivandrum districts; mainly in the hilly uplands and highlands (Map 105).

World

Kerala and Tamil Nadu in Peninsular India.

**Notes**

This is an endemic species of bamboo useful in cottage industry. The species has not been included by Krishnamurthy (1993) among other useful bamboos of India.



Map 105 Distribution of *Ochlandra wightii* (Munro) Fisch in Kerala

**Products and uses**

The culms are mainly used to make baskets and mats and for erecting huts. Along with other bamboos, it is also used for pulping. The leaves of this bamboo make fodder and also roofing material.

**References cited**

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Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi.

Kumar, Muktesh 1995. A re-investigation on the taxonomy of the genus *Ochlandra* Thw. (Poaceae-Bambusoideae). *Rheedea* 5(1):63-89.

**106. OROXYLUM INDICUM (L.) VENT.**  
(**Bignoniaceae**)

**Nomenclature**

*Oroxylum indicum* (L.) Vent., Dec. Gen. Nov. 8. 1808; Clarke in Hook.f., Fl. Brit. India 4: 378. 1884; Broud., For. Trees Trav. 279. 1908; Rama Rao, Fl. Pl. Trav. 294. 1914; Gamble, Fl. Presid. Madras 2: 774. 1921; Nicol. *et al.*, Intrap. Hort. Malab. 73. 1928; Krishnam., Min. For. Prod. India 219, 333, 357. 1993.

*Begonia indica* L., Sp. Pl. 625. 1753.

*Spathodea indica* Pers., Syn. Pl. 2: 173. 1806.

*Calosanthus indica* Bl., Bijdr. 761. 1826; Wt., Ic. Pl. Ind. Orient. 4: t. 1337-38. 1848.

**Local name(s)**

Aralu, Arantal, Palaka-paiyani.

**Description**

Stunted, deciduous **trees**, 5-8 m high with branches mostly confined towards apex; **branchlets** stout, green when young; **bark** yellowish grey, thick, smooth with numerous corky lenticels. **Leaves** opposite, very large, 2-3 pinnate, upto 30 x 20 cm; **leaflets** 2-4 pairs, 5-12 x 3-10 cm, entire, minutely lepidote, glabrous or rarely pubescent along the nerves, pale beneath, variable from obtuse to cordate at base, caudate-acuminate at apex; **petiolules** 0.5-2.5 cm long, stout. **Flowers** deep maroon to reddish-purple outside, creamy yellow with diffuse dull pink inside, upto 35 cm long in terminal racemes; **pedicels** 3-6 cm long, stout with bracts fused at base; **calyx** blackish-purple, 3-4 cm long, tubular, glabrous; **corolla** campanulate, upto 6 cm long, glandular within, lobed, grooved externally, minutely papillose; **stamens** 5, slightly exserted beyond the corolla tube, one shorter than others, longest one upto 5 cm long with anthers 0.7-0.9 cm long and locules parallel or slightly divergent; **pistil** with 1-1.5 cm long ovary, 4-5 cm long style and stigma upto 0.6 x 0.4 cm in size. **Capsules** upto 60 x 10 cm, flat, sword-shaped, tapering at both ends with semi-woody valves; **seeds** numerous, upto 2 cm in diameter, discoid, winged along the margins except the base.

**Ecology**

Rare, in the moist deciduous forests and also homesteads and wastelands of the State. Flowers, which attract bats during night, are produced during April to June and during October to January, fruits

## Distribution

### Kerala

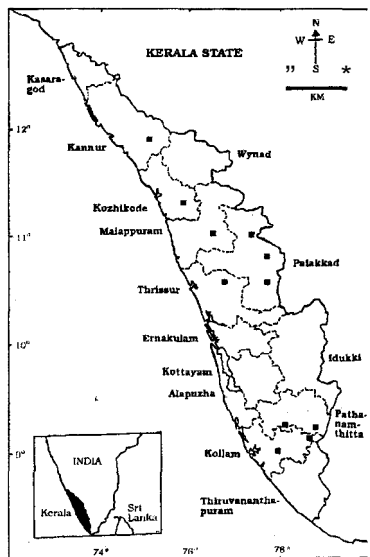
Cannanore, Calicut, Malappuram, Palghat, Trichur, Pathanamthitta and Quilon, districts; almost throughout the State, in the hilly uplands and highlands (Map 106).

### World

India, Sri Lanka, eastwards to South-East Asia, Indonesia and the Philippines.

## Products and uses

Most parts of this tree are medicinally important and especially its roots, which form a constituent of 'Dasamoola' (ten roots), an important combination in the Ayurvedic system of medicine. Young shoots and unripe fruits are also used as vegetable (Krishnamurthy, 1993). Stem bark and fruits are employed as mordants in tanning and dyeing industries. Roots also contain the 3-flavone colouring matter. Due to excessive exploitation, the tree has now become very rare in the natural forests and also homesteads where it was rather very common in the past.



Map 106. Distribution of *Oroxylum indicum* (L.) Vent. in Kerala

## Regeneration

This medium sized tree is more common in moist areas like stream-banks, sides of rivers, etc. in the evergreen and moist deciduous forests and also in homesteads. The tree do not favour heavily shaded conditions and possess a superficial root system. It coppices profusely around mother trees and natural regeneration by wind dispersed seeds is also quite common, depending upon the soil moisture conditions.

For artificial regeneration of *O. indicum*, ripened seeds can be collected during December to February, just before their dispersal. About 7762-13759 seeds weigh one kilogram (FRI, 1985). Dent (1948) had reported that the seeds remain viable on proper storage for about a year. Upto 95% germination is reported for the seeds within a period of 14-20 days (Sengupta, 1937). Direct sowing of seeds or planting out nursery-raised seedlings are practised for the propagation of the species. In the nursery, seeds collected before March can be sown during April in partially shaded beds and watered

regularly. Also root-suckers produced in the vicinity of mother trees can be transplanted. The tree grows fast in suitable habitats and the initial growth of about 4-5 m is without branching. Later, branches develop with clustered foliage and dense crown towards the terminal portions of branches.

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## 107. PALAQUIUM ELLIPTICUM (DALZ.) BAILL. ( Sapotaceae )

### Nomenclature

- Palaquium ellipticum* (Dalz.) Baill., *Traite Bot. Med. Phan.* 1500. 1884; Broud., *For Trees Trav.* 239.1908; Rama Rao, *Fl. Pl. Trav.* 236. 1914; Gamble, *Fl. Presid. Madras 2*: 764. 1921; van Royen, *Blumea 10*: 509. 1960; Krishnam., *Min. For. Prod. India* 303. 1993.
- Bassia elliptica* Dalz. in Hook., *J. Bot. & Kew Misc.* 3: 36. 1851; Bedd., *Fl. Sylvat. South. India t.* 43. 1869.
- Isonandra acuminata* Drury, *Useful Ind. Pl.* 260. 1858.
- Dichopsis elliptica* Benth., *Gen. Pl.* 2: 658. 1876; Clarke in Hookf., *Fl. Brit. India* 3: 542. 1882.

### Local name(s)

Choppala, Kattu-illupa, Pachendi, Pala, Pali.

### Description

**Trees** upto 30 m high; **branchlets** angular, terete or obscurely terete. **Leaves** simple, alternate, crowded at the apex of branches, 8-17.5 x 3.5-7.5 cm, obovate, obovate-oblong or subelliptic, dark green above, glabrous, cuneate at base, obtusely acuminate at apex with 8-12 pairs of prominent lateral nerves; **petioles** 1.5-2.5 cm long, glabrous. **Flowers** white, fragrant in axillary fascicles; **pedicels** 2-4 cm long; **calyx** of 6 sepals, biseriate, upto 0.8 cm long, densely villous, with the outer ones broadly-ovate and subacute, and inner row of lanceolate, acute lobes; **corolla** 5-6 lobed with lobes 0.7-0.9 x 0.4-0.5 cm, ovate-oblong, obtuse at apex; **stamens** 12-18, in two whorls, 0.8-1.2

cm long, with filaments upto 0.5 cm long, hairy, adnate and anthers upto 0.6 cm long, ovoid, caudate and fimbriate at apex; **pistil** with ovary upto 0.2 cm long, villous, style upto 1.8 cm long, filiform and capitate stigma. **Berries** upto 4 x 1.5 cm, oblong or ellipsoid, fleshy, 1-seeded; **seeds** light brown, upto 0.7 cm long, acute at both ends.

### Ecology

Lofty trees forming a prominent component of the top canopy, mostly in the evergreen forests. Flowers during December to April and fruits mature by August-September.

### Distribution

#### Kerala

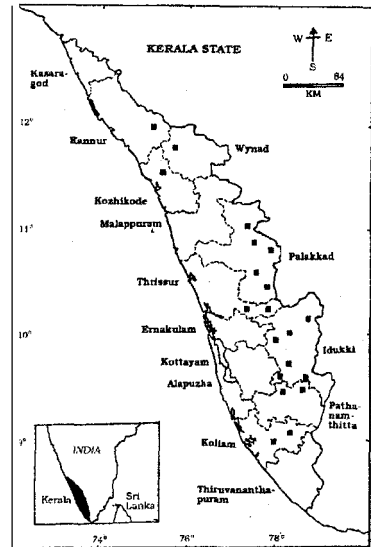
Cannanore, Wynad, Calicut, Palghat, Trichur, Idukki, Pathanamthitta and Quilon districts; almost throughout the State, mainly in highlands (Map 107).

#### World

Peninsular India in the Western Ghats from North Karnataka southwards.

### Products and uses

Trunk of the tree yields the gum called Indian gutta-percha, an inferior quality of the true gutta-percha. It is useful as a coating for ropes, soled shoes and in the manufacture of ground sheets (Anonymous, 1966). The gum is also used as water-proofing cement. Seeds of the tree yield an oil which is used as an illuminant and in soap manufacture (Krishnamurthy, 1993).



Map 107. Distribution of *Palaquium ellipticum* (Dalz.) Bail. in Kerala

### Production and marketing

The dried seeds of the tree is the non-wood produce collected and marketed from the forests of Kerala. The Kerala State SC & ST Federation (1988), during 1994-95, received about 50,500 kg of the dried seeds at the rate of Rs. 3.20 per kg, which was sold by the Federation at the cost of Rs. 3.50 per kilogram.

### Regeneration

The tree is characteristic to the wet evergreen forests of India and is therefore, shade-bearing, especially when young. But it is sensitive to fire and draught conditions and is often damaged by moving wild animals. Coppicing

is rather poor and germination of seeds below mature trees, eventhough profuse, survival of seedlings is rather poor due to various reasons.

Artificial regeneration of the species in canopy gaps where natural regeneration is poor has proved successful. Fruits ripen after 15 months of flowering, during the months of June-July. The seeds germinate immediately after dispersal or even while attached to the mother tree. Seeds can be collected from May onwards till August, and can be stored in gunny bags for 6-8 weeks. About 250-420 seeds weigh one kilogram and 60-79% germination is may be common with a plant percent of 20-68, It takes 20-45 days for the seeds to germinate (FRI, 1985). Soaking in cold water can enhance germination percentage of seeds. Direct sowing and transplanting of nursery raised seedlings are the methods suitable for the artificial regeneration of the species, eventhough protection of naturally regenerated seedlings is more effective and easy in natural forests, where natural regeneration quite profuse.

### References cited

- Anonymous, 1966. *The Wealth of India: Raw Materials*. vol. 7. CSIR, New Delhi. p. 212.
- FRI, 1985. *Troup's Silviculture of Indian Trees*. vol. 6. Controller of Publications, Delhi. pp. 76-83.
- Kerala State SC & ST Federation 1998. Different items of LFPP handled during 1994-95 to 1996-97 and price fixed by MFP Committee per kilogram for 1997-98. Trivandrum (unpublished).
- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi. p. 303.

## 108. PERSEA MACRANTHA (NEES) KOSTERM. ( Lauraceae )

### Nomenclature

*Persea macrantha* (Nees) Kosterm., Reinwardtia 6: 193. 1962.  
*Machilus macrantha* Nees in Wall., Pl. As. Rar. 2: 70. 1831; Wt., Ic. Pl. Ind. Orient. t. 1824. 1852; Bedd., Fl. Sylvat. South. India t. 264. 1872; Hook.f. in Hook.f., Fl. Brit. India 5: 140. 1886; Bourd., For. Trees Trav. 299. 1908; Rama Rao, Fl. Pl. Trav. 342. 1914; Gamble, Fl. Presid. Madras 2: 1227. 1925.

### Local name(s)

Kulamavu, Ooravu.

### Description

Evergreen trees, 10-22m high; **branchlets** glabrous. **Leaves** simple,

nate, mostly crowded at the apex of branchlets, 8-18 x 3-8 cm, elliptic, oblong or oblong-ovate, penni-nerved, glabrous above, coriaceous, pale or glaucous beneath, acute or obliquely truncate at base, obtuse or acute at apex; **petioles** 1.5-4 cm long, glabrous. **Flowers** greenish-white or yellowish in long, copiously branched terminal panicles with pubescent, reddish peduncles; **perianth lobes** 3+3, upto 0.4 cm long, obovate, puberulous or silky-pubescent, truncate at base, acute at apex; **stamens** 9 fertile with hairy filaments upto 0.2 cm long and 4-loculed anthers, each upto 0.1 cm long and 3 staminodes, upto 0.4 cm long, stalked, arrow-shaped; **pistil** with ovary above 0.1 cm long, style upto 0.2 cm in length and simple stigma. **Berries** dark green, dotted with white, ultimately turning black, upto 2 cm across, globose with persistent rim of perianth at base; **seeds** globose with thin testa.

### Ecology

Rather common in the moist deciduous, semi-evergreen and evergreen forests, especially along the fringes of grasslands and sholas. Flowering is mostly during November to January and fruits ripen by February-March.

### Distribution

#### Kerala

Cannanore, Wynad, Calicut, Malappuram, Palghat, Trichur, Ernakulam, Idukki, Pathanamthitta, Quilon and Trivandrum districts; almost throughout the State, mainly in the hilly uplands and highlands (Map 108).

#### World

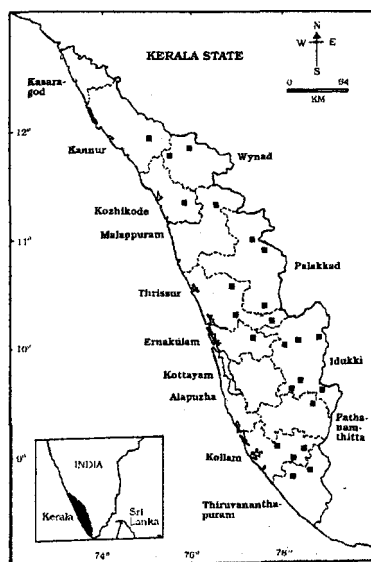
Peninsular India, Sri Lanka.

### Notes

This species, rather common in the forests of Western Ghats in Peninsular India, has not been included by Krishnamurthy (1993) in his work on forest products of non-timber use in India.

### Products and uses

Bark and leaves of this tree are medicinal. Powdered bark is mainly used in the treatment of tuberculosis, asthma and rheumatism and leaves are curative for ulcers (Anonymous, 1962). The timber of the species is used in construction work.



Map 108 Distribution of *Persea macrantha* (Nees) Kosterm in Kerala



**References cited**

Anonymous, 1962. *The Wealth of India: Raw Materials*. vol. 6. CSIR, New Delhi. pp. 204-205.

Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi.

**109. PHYLLANTHUS EMBLICA L.**  
( Euphorbiaceae )

**Nomenclature**

*Phyllanthus emblica* L., Sp. Pl. 982. 1753; Bedd., Fl. Sylvat. South. India t. 258. 1872; Hook.f. in Hook.f., Fl. Brit. India 5: 288. 1887; Bourd., For. Trees Trav. 292. 1908; Rama Rao, Fl. Pl. Trav. 355. 1914; Webster, J. Am. Arbor. 38: 76. 1957; Airy Shaw, Kew Bull. 26: 319. 1972; Nicol. *et al.*, Intrap. Hort. Malab. 114. 1988.

*Emblica officinalis* Gaertn., Fruct. 2: 122-123, pl. 108, fig. 2. 1790; Wt., Ic. Pl. Ind. Orient. t. 1896. 41852; Gamble, Fl. Presid. Madras 2: 1295. 1925; Krishnam., Min. For. Prod. India 55, 197, 330, 348. 1993.

**Local name(s)**

Amalakam, Nelli, Nellika-maram.

**Description**

**Trees**, 5-12 m high; **bark** rough, flaking; **branchlets** glabrous or fine pubescent, reddish tinged. **Leaves** simple, bifarious or distichous, subsessile, 1-1.5 x 0.3-0.4 cm, linear-oblong, entire, glabrous, truncate or subcordate at base, apiculate at apex; **stipules** minute, linear. **Flowers** greenish-yellow, in axillary, monoecious fascicles; **male flowers** upto 0.3 cm across, on short, slender pedicels; **tepals** 6, oblong-acute, glabrous; **stamens** 3, upto 0.3 cm long, connate into a central column bearing 3 oblong anthers, each upto 0.1 cm in length with 6-glandular disc at base; **female flowers** few with tepals as in the male with disc lacerate at apex, cup shaped; **pistil** almost above 0.1 cm across, globose, with fimbriate, recurved styles upto 0.2 cm long. **Drupes** green turning light yellow, upto 2 cm across, depressed globose, fleshy with three crustaceous cocci; **seeds** 6, trigonous (Fig. 32).



Fig. 32. *Phyllanthus emblica* L.

## Ecology

Medium sized trees, rather common in both moist and dry deciduous forest areas, mostly in openings, disturbed areas and fringes of forests. Also grown in homesteads and waste places in the plains. Flowers are produced during January to March or upto June and fruits mature by November-December.

## Distribution

### Kerala

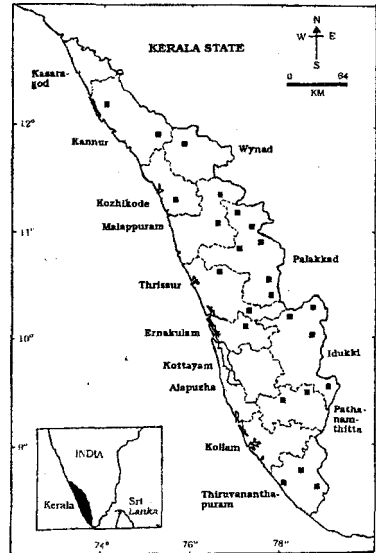
Cannanore, Wynad, Calicut, Malappuram, Palghat, Trichur, Ernakulam, Idukki, Pathanamthitta and Trivandrum districts; almost throughout the State, mainly from the mid to the highlands; also cultivated (Map 109).

### World

Native of America; pantropical (wild or cultivated).

## Products and uses

The tree yield the Indian gooseberry of commerce, used extensively for the extraction of vitamin C, as an important ingredient of the 'Thriphala' (three fruits) and other combinations in the Ayurvedic system of medicine. It is also used extensively in the preparation of curries, pickles and jellies and are also eaten raw. Gooseberry is considered in high esteem in the indigenous system of medicine as cooling, diuretic and laxative (Krishnamurthy, 1993). Dried fruits are also used in medicine to cure hoemorrhaze, diarrhoea, dysentery, anaemia, jaundice, The fruits are extracted when ripe and marketed as such or dried and stored mainly for the extraction of vitamin C. The fruits are also used in the preparation of writing ink, hair dyes and as a detergent of hair. The hard seeds are also medicinal against asthma, bronchites, etc. The stem and leaves contain a brownish yellow colouring matter (tannin) used in dyeing tussar and mulberry silks. The pulp of fruits also contains a dark brown dye. Due to its excessive extraction and use, the product has now become very scarce in the natural forests where it was plenty in the past and it is being cultivated now, especially in the homesteads.



Map 109. Distribution of *Phyllanthus emblica* L. in Kerala.

## Production and marketing

The fruits of the plant is commercially called Gooseberry or Amala, which is marketed either fresh or in the dried condition. During 1994-95 to 1996-97,

the Kerala State SC & ST Federation (1998) procured about 5,69,943 kg of fresh Amala fruits at the cost of Rs. 3.60 per kg, which was sold at the rate of Rs. 3.80 per kilogram. However, the quantity of dried fruits, used mainly in medicinal preparations, has not been accounted by the Federation. With regard to the total production and consumption of the product in India, there is also no record available (Shiva, *et al.* 1996). In fact, at the country level, what is available is only the export figures. and during 1980-81, about 25 tonnes of the product was exported from India, worth about Rs. 0.1 million.

### Regeneration

The tree is a light demander and is sensitive to draught and frost conditions. It coppices well and pollards to some extent. Under natural conditions, ripened fruits fall on the ground and their fleshy covering dry up thereby exposing the fruit-stones to split open and release the seeds. The seeds germinate during the next rainy season. However, natural regeneration of the species is not satisfactory due to low viability of the seeds and sensitivity of seedlings to shade, weed growth, frost, and so on.

For artificial multiplication of the species, planting of nursery raised seedlings and direct sowing of seeds can be done. Fruits ripen during November to March and they can be collected and sun-dried till the stones dehisce to liberate seeds. About 68-70 seeds weigh one gram. The viability of seeds is very short and germination percentage is only about 40 (Luna, 1996). However, seeds treated with hot water for five minutes, is reported (Anonymous, 1987) to give a germination up to 80 percent. Seeds sown in nursery beds germinate within 40-60 days with regular but regulated watering. Within about a year, the seedlings attain a height of 25-30 cm and can be field-planted during the next rainy season. Planting with a ball of earth around the roots or pricked and poly-plotted seedlings raised in the nursery perform better in the field in terms of survival and growth. The seedlings are often much affected by weed growth, shade and similar field problems. The trees can also be regenerated by budding, cuttings and inarching as the seeds are low germinating (Luna, 1996).

### References cited

- Anonymous, 1987 *Nursery Manual* National Wasteland Development Board New Delhi
- Kerala State SC & ST Federation 1998 Different items of LFPP handled during 1994-95 to 1996-97 and price fixed by MFP Committee per kilogram for 1997-98 Trivandrum (unpublished)
- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi. pp. 55-56, 330-331, 349.
- Luna, R. K. 1996. *Plantation Trees*. International Book Distributors, Dehra Dun. pp.

Shiva, M.P., S. Aswal, A. Sharma, P. Mathur and R. Chandra 1996. *Trends of Export and Import of the Minor Forest Products in India*. Centre for Minor Forest Products, Dehra Dun. 38 p.

**110. PIPER LONGUM L.**  
( Piperaceae )

**Nomenclature**

*Piper longum* L., Sp. Pl. 29. 1753; Hook. f. in Hook. f., Fl. Brit. India 5: 83. 1886; Rama Rao, Fl. Pl. Trav. 336. 1914; Gamble, Fl. Presid. Madras 2: 1205. 1935; Rahim. et Nair, J. Bombay nat. Hist. Soc. 84: 80, fig. 8. 1987; Nicol. et al., Intrap. Hort. Malab. 209. 1988; Krishnam., Min. For. Prod. India 79-80. 1993.

*Piper tubinatum* Noronha in Verh., Batav. Gen. 5: 25. 1790.

*Piper latifolium* Hunter, Asiat. Res. 9: 390. 1809.

*Piper sarmentosum* Wall., Cat. no. 6641. 1832.

*Chavica roxburghii* Miq., Syst. Pip. 230. 1843; Wt., Ic. Pl. Ind. Orient. t. 1928 1853.

*Chavica sarmentosa* Miq., London J. Bot. 4: 433. 1845; 5: 531. 1845 (non Syst. Pip. 1846).

**Local name(s)**

Magadhi, Pippali, Thippali.

**Description**

Ascending or prostrate **undershrubs**, upto 1 m long; **branches** rooting at nodes, stout, cylindrical, thickened above and slightly pubescent at nodes.

**Leaves** simple, alternate, 4.5-7.5 x 3-6 cm, broadly-ovate to oblong-ovate, glabrous, dark green above, pale beneath, 7-ribbed, ribs sunk above, raised beneath, cordate at base, subacute at apex;

**petioles** 4-7.5 cm long, stout or terminal leaves sessile. **Flowers** greenish, minute, in solitary, pedunculate, slender spikes; **male spikes** slender with narrow bracts;

**female spikes** 2-2.5 cm long with circular, peltate, flat bracts; **stamens** two, minute; **pistil** with 3-4, stout, spreading stigmas. **Fruits** blackish-green and shiny when young, red when ripe, 0.2-0.3 cm across, ovoid, sunk in the fleshy peduncles of spikes; **seeds** upto 0.1 cm in diameter, globose with hard endosperm (Fig. 33).



Fig. 33. *Piper longum* L.

**Ecology**

Prostrate or suberect herbs, rooting at nodes, common in wet and shaded areas in the evergreen and semi-evergreen forests, mostly as an undergrowth. Sometimes the plant is also seen as a climber on hedges or shrubaceous undergrowth. Flowers during April-May and fruits ripen by November-December. The plant is cultivated in Bengal using suckers.

**Distribution**

**Kerala**

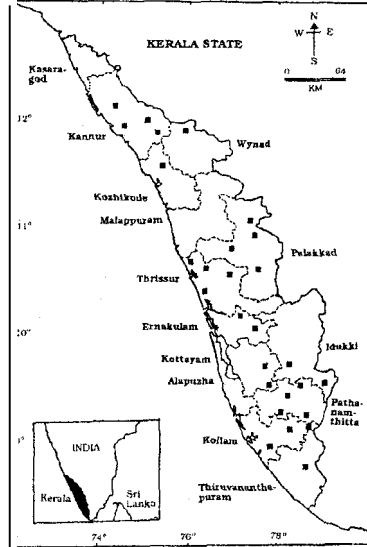
Cannanore, Wynad, Calicut, Palghat, Trichur, Ernakulam, Idukki, Kottayam, Pathanamthitta, Quilon and Trivandrum districts; almost throughout the State (Map 110).

**World**

India, Sri Lanka, Malesia.

**Products and uses**

This is the Indian long pepper plant. Almost all parts of it, namely roots, stems and fruits are medicinally used, especially in the treatment of diseases of respiratory tract like bronchitis, asthma, and so on. It is a stimulant, expectorant, carminative and alterative tonic (Krishnamurthy, 1993). Also fruits of the plant are used as a spice and for the preparation of pickles. As the plants as such are excessively extracted from its natural source, the species has now become very rare in the forests of Kerala.



Map 110. Distribution of *Piper longum* L in Kerala.

**Production and marketing**

Long pepper is mainly consumed domestically, as an ingredient in several medicinal preparations. However, there is no data available on the exact quantity of the domestic consumption of it, either for the State or for the Country and the data on the turn over of the product in Kerala State through the SC & ST Federation (1998) is about 12,782 kg during 1994-95 to 1996-97. The rate of procurement of the drug item by the Federation was Rs. 13.30 per kg and the selling rate was Rs. 14.00 per kilogram. From India, during 1990-91, about 28.7 tonnes of long paper was also exported at a cost of Rs. 2.3 million (Shiva, *et al.* 1996)

**References cited**

- Kerala State SC & ST Federation 1998 Different items of LFPP handled during 1994-95 to 1996-97 and price fixed by MFP Committee per kilogram for 1997-98 Trivandrum (unpublished)
- Krishnamurthy, T 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi. pp. 79-80.
- Shiva, M.P., S. Aswal, A. Sharma, P. Mathur and R. Chandra 1996. *Trends of Export and Import of the Minor Forest Products in India*. Centre for Minor Forest Products, Dehra Dun. 38 p.

**111. PIPER NIGRUM L**  
( Piperaceae )

**Nomenclature**

*Piper nigrum* L., Sp. Pl. 28. 1753; Wt., Ic. Pl. Ind. Orient. t. 1935. 1852; Hook.f. in Hook.f., Fl. Brit. India 5: 90. 1886; Rama Rao, Fl. Pl. Trav. 337. 1914; Gamble, Fl. Presid. Madras 2: 1206. 1925; Krishnam., Min. For. Prod. India 163-164. 1993.

**Local name(s)**

Kattu-kurumulagu, Nalla-mulagu.

**Description**

Stout, root climbing, glabrous **shrubs**, about 6 m high; **stems** with prominent, rooting nodes and dark green cylindrical internodes. **Leaves** simple, alternate, 14-20x 5.5-8 cm, broadly ovate, entire, glabrous, rounded to broadly acute and 7-nerved at base, shortly acuminate at apex; **petioles** upto 2.5 cm long, glabrous, thick. **Flowers** in pale yellowish, 7-12 cm long, slender, cylindrical, axillary spikes; **bracts** upto 0.1 cm long, concave, partly embedded in the peduncle, entire, obtuse at apex; **bracteoles** forming a hood-like ridge, partly covering the pistil; **calyx** and **corolla** absent; **stamens** 2 on either side of the pistil with stout, flat filaments, less than 0.1 cm long and anthers 2-loculed with widely separated lobes partly embedded in the fleshy filament; **pistil** with upto 0.2 cm long, ovoid ovary and 3 or 4 unequal, spreading recurved, stigmatiferous style. **Berries** green turning red, upto 0.4x 0.3 cm, ovoid-globose, 1-seeded.

**Ecology**

Pepper plants are more in cultivation than in wild, even though they are frequent in the moist deciduous and semi-evergreen forests of the State. Tribals and other forest produce gatherers collect fruits of the plant as wild pepper, during March-May, when they get ripened.

## Distribution

### Kerala

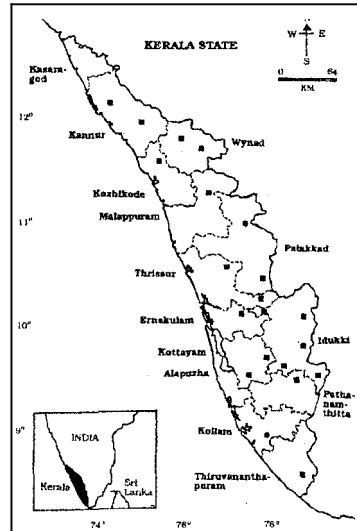
Cannanore, Wynad, Calicut, Malappuram, Palghat, Trichur, Ernakulam, Idukki, Kottayam, Pathananithitta, Quilon and Trivandrum districts; throughout the State, mainly from the mid to the highlands (Map 111).

### World

Peninsular India, Sri Lanka.

## Products and uses

This is the black pepper of commerce, marketed after drying the mature fruits. It is also processed into white pepper by removing the rind and drying. Fresh, tender fruits are also pickled. Black and white pepper are major condiments used extensively in various preparations. White pepper is also used in breweries for growing yeast and to impart pungent taste to liquors. Both the pepper samples possess pungent and aromatic properties due to presence of mainly the alkaloid piperine (Anonymous, 1969).



Map 111. Distribution of *Piper nigrum* L. in Kerala

Pepper is also highly medicinal as aromatic, stimulant, stomachic, alterative and rubefacient. Piperine has also been reported (Anonymous, 1969) to possess insecticidal properties.

## Production and marketing

The major share of Black pepper in the market comes from cultivation of the species in both forest and non-forest areas. However, from the forest areas, the Kerala State SC & ST Federation received about 127 kg of the item at the cost of Rs. 47.50 per kg which the Federation disposed off at the rate of Rs. 50.00 per kilogram. From wild, more than black pepper, the medicinal roots of the plants are extracted as shown by the collection data of the Federation for 1994-95 to 1996-97 (Kerala State SC & ST Federation). In fact, during 1994-95 to 1996-97, about 3870 kg of the roots of *P. nigrum* plants were gathered from the forest areas of the State. The procurement cost of the item by the Federation during 1994-95 to 1996-97 was Rs. 9.50 per kg which was disposed off at the rate of Rs. 10.00 per kilogram.

From India, pepper products like black pepper (garbled and ungarbled), dehydrated green pepper, white pepper, pepper pimento, crushed or ground

pepper and pepper in brine are exported. This is in addition to the oleo-resin extract of the fruits, marketed outside the country. During 1980-81, about 50,000 tonnes of various pepper products other than the oleo-resin was exported from India and this was reduced to about 30,103 tonnes during 1990-91. Pepper oleo-resin to the tune of 2605 and 313 tonnes was also exported from India during the two financial years and the revenue received it were Rs. 14.9 and Rs. 98.8 millions, respectively (Shiva, *et al.* 1996). No doubt, the share of wild pepper in the export figures is very little or even absent.

### Regeneration

In natural conditions, wild pepper regenerates mainly from vines which spread and climb on nearby supports. For artificial regeneration also, vegetative method is commonly used for which mature, basal or middle portion of the stem or terminal part of the vine are ideal. Propagation by layering or grafting is also quite common (Anonymous, 1969).

For raising seedlings, ripened fruits are collected and soaked in water for 2-3 days to remove the outer skin and the seeds extracted are dried in shade. The seeds can be sown in nursery beds and the seedlings will be ready for field planting when they develop 4-5 leaves.

### References cited

- Anonymous, 1969. *The Wealth of India: Raw Materials*. vol. 8. CSIR, New Delhi. pp. 99-115.
- Kerala State SC & ST Federation 1998. Different items of LFPP handled during 1994-95 to 1996-97 and price fixed by the MFP Committee per kilogram for 1997-98. Trivandrum (unpublished).
- Shiva, M.P., S. Aswal, A. Sharma, P. Mathur and R. Chandra 1996. *Trends of Export and Import of the Minor Forest Products in India*. Centre for Minor Forest Products, Dehra Dun. 38 p.

## 112. PLUMBAGO ZEYLANICA L. ( Plumbaginaceae )

### Nomenclature

*Plumbago zeylanica* L., Sp. Pl. 151. 1753; Wt., Ill. Ind. Bot. t. 1: 179. 1840; Clarke in Hook. f., Fl. Brit. India 3: 480. 1882; Rama Rao, Fl. Pl. Trav. 231. 1914; Gamble, Fl. Presid. Madras 2: 744. 1921; Nicol. *et al.*, Intrap. Hort. Malab. 209. 1988; Krishnam., Min. For. Prod. India 81. 1993.

### Local

Chittaratha, Thumpa-koduveli, Vella-koduveli



## Description

Scandent **undershrubs**, upto 0.75 m high; **branchlets** terete, striate, glabrous. **Leaves** simple, alternate, 4-9 x 2-4.5 cm, elliptic-ovate, glabrous or puberulous, truncate to attenuate at base, acute or acutely apiculate at apex; **petioles** upto 1 cm long, base dilated, amplexicaul. **Flowers** white, about 2.5 cm long in 6-9 cm long terminal racemes; **bracts** upto 0.5 cm long, ovate, acute; **pedicels** very short or flowers subsessile; **calyx** upto 1.2 cm long, tubular, 5-lobed with stalked glands all over; **corolla** tubular, upto 1.5 cm long, 5-lobed, with lobes upto 0.8 cm long, narrowly obovate; **stamens** 5 with filaments upto 1.5 cm long and anthers almost 0.2 cm in length; **pistil** with ovary upto 0.3 cm long, style almost 1 cm in length and 5-lobed stigma. **Capusles** 1-1.5cm long, oblong, pointed characteristically, glandular-hairy; **seeds** single, cylindric, pendulous.

## Ecology

Forming part of the ground flora, the plant is rather common in the moist deciduous forests, especially in openings. The plant flowers during July to September and fruits are produced from September to February.

## Distribution

### Kerala

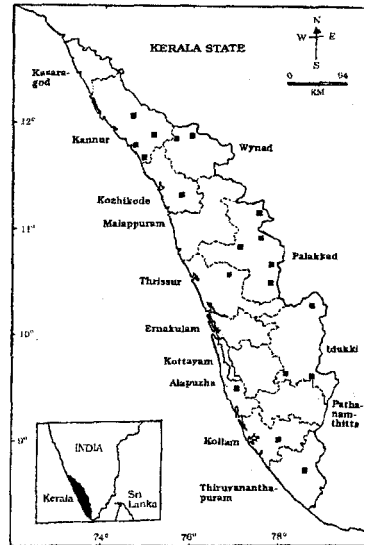
Cannanore, Wynad, Calicut, Palghat, Trichur, Idukki, Alleppy, Quilon and Trivandrum districts; almost throughout the State (Map 112).

### World

Pantropical.

## Products and uses

Roots and bark of stems of the plant are highly medicinal and therefore extracted on a large scale from forest areas. The root bark contains Plumbagin, glucose, fructose and the enzymes protase and invertase (Anonymous, 1969). The roots are used as a carminative by local people (Krishnamurthy, 1993) and are reported to possess anti-bacterial activities. As reported by Maikhuri and Gangwar (1993), a peice of root is tied to the neck of children with general debility, as a remedial measure.



Map 112 Distribution of *Plumbago zeylanica* L. in Kerala.

### Production and marketing

During 1994-95, about 5000 kg of the dried roots of the plant was available to the Kerala State SC & ST Federation (1998), which was reduced to about 119 kg during 1996-97 with no data available for the year 1995-96 on the collection of the item. The dried roots are procured by the Federation at the rate of Rs. 14.25 per kg which was disposed off for Rs. 15.00 per kilogram.

### References cited

- Anonymous, 1969. *The Wealth of India: Raw Materials*. vol. 8. CSIR, New Delhi p. 164.
- Kerala State SC & ST Federation 1998. Different items of LFPP handled during 1994-95 to 1996-97 and price fixed by the MFP committee per kilogram for 1997-98. Trivandrum (unpublished).
- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi. p. 81.
- Maikhuri, R.K. and A.K. Gangwar 1993. Ethnobotanical notes on the Khari and Garo tribes of Meghalaya, North-East India. *Eco. Bot.* 47(4): 354.

## 113. PONGAMIA PINNATA (L.) PIERR. ( Papilionaceae )

### Nomenclature

- Pongamia pinnata* (L.) Pierr., Fl. For. Coch. sub. t. 385. 1899; Thoth., Bull. bot. Surv. India 3: 417-423. 1961; Nicol. *et al.*, Intrap. Hort. Malab. 740. 1988; Krishnam., Min. For. Prod. India 82,288, 303,415,451,481. 1993.
- Cystisus pinnatus* L., Sp. Pl. 743. 1753.
- Pongamia glabra* Vent., Jard. Malm. t. 28. 1803; Wt. *et* Arn., Prodr. 262. 1834; Wt., Ic. Pl. Ind. Orient. t. 59. 1838; Bedd., Fl. Sylvat. South. India t. 177. 1872; Baker in Hook.f., Fl. Brit. India 2: 240. 1876; Bourd., For. Trees Trav. 121. 1908; Rama Rao, Fl. Pl. Trav. 132. 1914; Gamble, Fl. Presid. Madras 1: 385. 1918.

### Local name(s)

Minari, Pungu, Punnu, Ungu.

### Description

8-15 m high with spreading branches; **branchlets** slender, weak, glabrous. **Leaves** alternate, imparipinnate, 8-35 cm long with 5-7 leaflets; **leaflets** 3.5-13 x 2-7.5 cm, ovate, elliptic or rarely elliptic-oblong, glabrous, subcoriaceous, narrowed and cuneate or rarely rounded to deltoid at base, acute to shortly acuminate at apex; **petiolules** 0.5-1 cm long, stout. **Flowers** white tinged with pink or violet or in their varying combinations, in axillary

racemes, shorter than the leaves; **pedicels** upto 1 cm long, slightly puberulous; **calyx** purplish, 0.2-0.3 cm long, campanulate, truncate or obscurely lobed, brown pubescent; **corolla** upto 1 cm long, with the standard petal upto 1 cm broad, shortly clawed, emarginate at apex; **stamens** 10, monadelphous, one free below and above and united with the column at the middle with oblong, versatile anthers; **pistil** with subsessile, brown-hairy ovary, incurved style and minute stigma. **Pods** 3-6.5 x 1.5-3 cm, elliptic to oblong or obliquely oblong, flattened, woody, mucronate at apex, 1-seeded; **seeds** reddish brown, reniform, thick with a small hilum (Fig. 34).



Fig. 34. *Pongamia pinnata* (L.) Pierr.

Flowers mostly during February to May and fruits mature by June-July, which persist on the tree almost throughout the year.

**Ecology**

Trees, common in the moist and dry deciduous forests of Kerala, mostly along stream banks, roadsides, in wastelands and avenues and gardens, where they are also often planted.

**Distribution**

**Kerala**

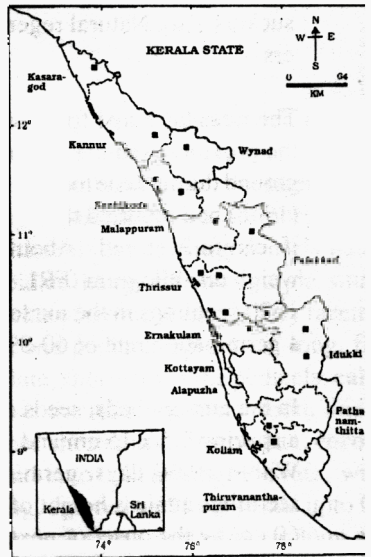
Kasaragod, Cannanore, Wynad, Calicut, Malappuram, Palghat, Trichur, Emakulam, Idukki, Pathanamthitta and Quilon districts; almost throughout the State (Map 113).

**World**

Himalayas to Peninsular India, Andaman Islands, Sri Lanka, Myanmar, Malesia.

**Notes**

Thothathri (1961) has given a detailed discussion on the nomenclature of this plant, commonly known in Indian Floras as *Pongamia glabra* Vent.



Map 113 Distribution of *Pongamia pinnata* (L) Pierr in Kerala

### Products and uses

Seeds which yield the Pongu oil, used in industries and in medicine, is the major non-timber product extracted from the tree, even though bark and leaves also possess therapeutic properties. Pongu oil (27-39% of seed weight) is mainly used in tanning industry for dressing leather. The oil is also used in soap industry and as lubricant and illuminant. Medicinally, the oil or paste of seeds is used in the treatment of leprosy sores, skin diseases and rheumatism. Due to the active component Karangin present in the seed oil, it also possesses insecticidal and antibacterial properties. Oil cake makes rich manure, as it cannot be used as cattle feed due to bitter taste. Bark and leaves are also medicinal for bleeding piles and ulcers and the fruits are reported (Narayana Ayer & Kolammal, 1960) to be used in the treatment of urinary diseases. Mixed with other hard woods, the wood of *P. pinnata* is used for paper making also (Krishnamurthy, 1993).

### Regeneration

The tree, not a shade-lover, can withstand drought, frost and saline soil conditions to some extent. It is a profuse coppicer and usually produce root suckers also. Natural regeneration is very common by seeds and root suckers.

The trees bear ripe fruits during June to July which are from the flowers of the previous year. The pods dispersed from the tree can be collected from ground during June to July, sun-dried and seeds separated mechanically. Dent (1948) had reported that viability of seeds may be retained upto one year, if carefully stored. About 450-530 pods contain 800-1480 seeds which weigh one kilogram (FRI, 1983). One kilogram of seeds will produce about 1000 seedlings in the nursery without any pre-sowing treatments, recording a germination rate of 60-89%.

In the nursery beds, seeds can be dibbled any time after collection at about a spacing 7.5 x 15 cm and mulching is found helpful for seed germination. Within 10-30 days, germination will be completed. Pricked and bagged seedlings attain a height of 25-30 cm in the first growing season and about 60 cm by the onset of next monsoon, when they are ready for outplanting. Direct sowing and planting of root and shoot cuttings and root suckers are also other means of artificially multiplying the tree.

### References cited

- Dent, T.V. 1948. The storage of seeds of Indian forest plants. *Indian Forest Records - New Series 7(1) Silviculture*. Manager of Publications, New Delhi. 134 p.
- FRI, 1983. *Troup's Silviculture of Indian Trees*. vol. 4. FRI & Colleges, Dehra Dun. pp. 296-300.

- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi. p. 481.
- Narayana Ayer, K. and M. Kolammal 1960. *Pharmacognosy of Ayurvedic Drugs*. Series 1, No.4. Dept. of Pharmacognosy, University of Kerala, Trivandrum.
- Thothathri, K. 1961. Studies in Leguminosae 2. The genus *Pongamia* Vent. in India. *Bull. bot. Surv. India* 3:417-423. pl. 2.

**114. PSEUDARTHRIA VISCIDA (L.) WT. ET ARN.**  
( **Papilionaceae** )

**Nomenclature**

*Pseudarthria viscida* (L.) Wt. et Arn., Prodr. 209. 1834; Wt., Ic. Pl. Ind. Orient. t. 286. 1838; Baker in Hook.f., Fl. Brit. India 2: 154. 1876; Rama Rao, Fl. Pl. Trav. 442. 1914; Gamble, Fl. Presid. Madras 1: 334. 1918; Steenis, Reinwardtia 6: 105. 1961.

*Hedysarum viscidum* L., Sp. Pl. 747. 1753.

**Local name(s)**

Moovila.

**Description**

Perennial, decumbent **herbs**, upto 1.5 m long; **branches** slender, more or less clothed with soft, whitish hairs. **Leaves** alternate, 3 foliate; **leaflets** stipellate, terminal one 3.5-8 x 3 x 5 cm, rhomboid-ovate, the lateral ones 2.5-4 x 1-3.5 cm, obliquely ovate-oblong or subrhomboid, all more or less hairy above, densely grey-silky beneath; rachis 3-6 cm long, densely hairy; **stipules** 0.4-0.6 cm long, lanceolate, cuspidate, hairy. **Flowers** purple, small, numerous, in distant fascicles along the rachis of terminal and axillary racemes or panicles with peduncles 2-6 cm long and pedicels upto 1 cm long, filiform, spreading; **bracts** lanceolate-subulate, shorter than the pedicels; **calyx** upto 0.3 cm long, hairy, toothed as long as the tube, the lower tooth linear-subulate, upto 0.2 cm long, the upper ones shorter and subconnate; **corolla** pinkish white, exerted with standard petal upto 0.4 cm long, obovate, wing petals upto 0.5 cm long, obliquely oblong, spurred and keel petals upto 0.5 cm long, obtuse; **stamens** 9+1, with staminal sheath upto 0.4 cm long and filaments about 0.1 cm long, subequal; **pistil** with ovary about 0.4 cm long, tomentose with numerous ovules, style about 0.2 cm long, incurved and capitate stigma. **Pods** about 1.5 cm x 0.5 cm, linear-oblong, flattened, clothed with fine, crooked, viscous hairs, densely ciliate along the margins, one or both sutures often slightly indented between the seeds; **seeds** 4-6, brownish-black, upto 3 cm long, subreniform, compressed.

**Ecology**

Perennial ground herbs forming an undergrowth in moist deciduous forests at low and medium altitudes (upto about 1000 m above msl). The plant flowers during October-November or upto March and fruits mature by December-January or by April.

**Distribution**

**Kerala**

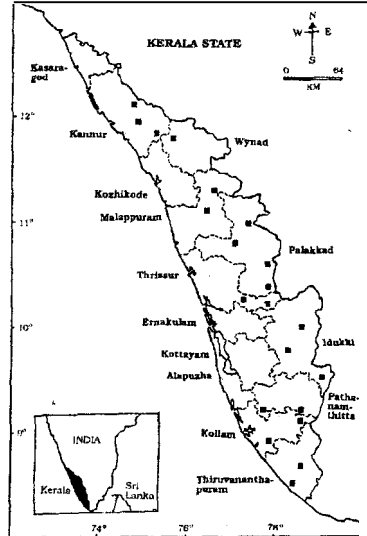
Cannanore, Wynad, Malappuram, Palghat, Trichur, Idukki, Pathanamthitta, Quilon and Trivandrum districts; almost throughout the State, mainly from the mid to the highlands (Map 114).

**World**

India, Sri Lanka, Timor.

**Notes**

This medicinal plant, common in the forests of Kerala, has not been included in the work of Krishnamurthy (1993).



Map 114. Distribution of *Pseudarthria viscida* (L.) Wt. et Arn. in Kerala.

**Products and uses**

Roots are the medicinally important part of the plant extracted from the natural forests of moist deciduous type. It possesses an astringent taste and is used as substitute for the roots of *Desmodium gangeticum* (L.) DC. one of the component of Dasamoola (ten roots) combination. Roots are also used in the treatment of biliousness, rheumatism, fever, diarrhoea, asthma, heart diseases, worms and piles.

**Production and marketing**

The extracted and marketed produce from *P. viscida* plant is the dried roots which is medicinal. About 34,906 kg of the drug item was received by the Kerala State SC & ST Federation (1998) during 1994-95 to 1996-97 at a cost of Rs. 14.25 per kilogram. The Society sold the item for Rs. 15.00 per kg during the period. From non-forest areas also, certain quantity of the medicinal roots are collected and marketed, for which there is no quantified data available and the cost is also not known.

**References cited**

Kerala State SC & ST Federation 1998. Different items of LFPP handled during 1994-95 to 1996-97 and price fixed by MFP Committee per kilogram for 1997-98. Trivandrum (unpublished).

Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi.

**115. PSEUDOXYTENANTHERA BOURDILLONII (GAMBLE.) NAITH.  
( Bambusaceae )**

**Nomenclature**

*Pseudoxytenanthera bourdillonii* (Gamble) Naith., J. Bombay nat. Hist. Soc. 87: 440. 1990; Tew., Monogr. Bamb. 124. fig. 1-4. 1992.

*Oxytenanthera bourdillonii* Gamble, Ann. Roy. bot. Gardn. Calcutta 7: 76. t. 67. 1896 & in Hook.f., Fl. Brit. India 7: 403. 1897; Bourd., For. Trees Trav. 401. 1908; Rama Rao, Fl. Pl. Trav. 447. 1914; Fisch. in Gamble, Fl. Presid. Madras 3: 1861. 1934; Verm. *et* Bah., Indian For. Rec. (n.s.) Bot. 6(1): 4. 1980.

**Local name(s)**

Arambu, Kambu.

**Description**

Straggling bamboos, 6-9 m high, forming open clumps; **culms** hollow, glabrous with long internodes; **culm-sheath** 15-30 x 10-30 cm, strait, glabrous except for few stiff, black hairs below; **ligules** obscurely serrate. **Leaves** upto 20 x 3 cm, linear-lanceolate, scaberulous near the margins and midrib above and smooth below, scabrous along the edges, acuminate at apex ending in a twisted, scabrous point; **leaf-sheaths** striate with a pair of shiny calluses dipressed between at the end; **ligules** long serrate. **Flowers** (spikelets) upto 1.5 cm long, robust, in large panicles of spicate branchlets having globular heads of many spikelets, each 3-flowered and mucronate; **glumes** 2 empty and 1 flowering which is longer; **palea** 2 keeled, ciliate and 3 nerved along the keels; **stamens** exerted with apiculate anthers; **pistil** with ovoid-acute ovary, hairy style and 3 subplumose stigmas. **Caryopsis** linear-oblong with hairy enlarged base of the style at the apex, grooved on one side.

**Ecology**

Rare straggling bamboos forming open clumps, confined to the hilly and rocky tracks of the State between 900-1500 m altitude. Blatter (1929) reported the species to have flowered in 1889 and according to Brandis (1899) flowering of this species is at very long intervals. After flowering the culms perish.

**Distribution**

Kerala

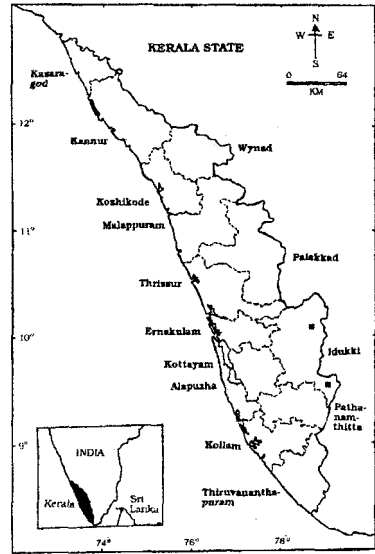
Idukki District, in the highlands of the State (Map 115).

World  
Kerala State, India.

**Notes**  
This highly endemic bamboo species of Kerala is not enumerated by Krishnamurthy (1993) along with other useful bamboos of the forests of India.

**Products and uses**  
The culms of this bamboo are used by hill-men for making combs and such other domestic items. The long internodes are suitable to carry maps in the tubular portion.

**Production and marketing**  
Large quantity of the stem of this bamboo is collected from the natural forests of Kerala and the Kerala State SC & ST Federation (1998) gathered about 6,48,358 kg of the item during 1994-95 to 1996-97. However, collection price and selling rate of this material is not specified by the Federation in their document on non-wood forest produces, collected and marketed by them.



Map 115. Distribution of *Pseudoxytenanthera bourdillonii* (Gamble) Naitli. in Kerala

**References cited**  
Blatter, E. 1929. The Flowering of bamboos. *J. Bombay nat. Hist Soc.* 33: 899-921.  
Brandis, D. 1899. Biological notes on Indian Bamboos. *Indian For.* 25: 1-25.  
Kerala State SC & ST Federation 1998. Different items of LFPP handled during 1994-95 to 1996-97 and price fixed by MFP Committee per kilogram for 1997-98. Trivandrum (unpublished).  
Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi.

**116. PSEUDOXYTENANTHERA MONADELPHA (THW.) SODES. ET ELLIS  
( Bambusaceae )**

**Nomenclature**  
*Pseudoxytenanthera monadelpha* (Thw.) Sodes. et Ellis, Smith. Contrib. Bot. n.s. 72: 52.1988; Tew., Monogr. Bamb. 124-125.1993.  
*Dendrocalarnus monadelphus* Thw., Enum. Pl. Zeyl. 376.1864.



*Oxytenanthera thwaitesii* Munro, Trans. Linn. Soc. London 26: 129. 1868; Gamble, Ann. Roy. bot. Gardn. Calcutta 7: 72. t. 64. 1896 & in Hook. f., Fl. Brit. India 7: 402. 1896.

*Oxytenanthera monadelpha* (Thw.) Alston in Trim., Handb. Fl. Ceylon (suppl.) 342. 1931; Fisch. in Gamble, Fl. Presid. Madras 3: 1861. 1934; Varm. et Bah., Indian For. Rec. (n.s.) Bot. 6(1): 4. 1980.

### Local name(s)

Watte (Gamble, 1896).

### Description

Straggling or subscandent, reed-like bamboos, 3-6 m high; **culms** upto 2.5 cm in diameter, smooth, often ending in a curved, much branched apex with very small leaves and internodes 30-40 cm long, rough and hairy when young; **culm-sheaths** upto 15 x 8 cm, truncate at mouth, ciliate along the margins, appressed hairy to nearly glabrous on the back; **ligules** long and fimbriate on older sheaths and small and narrow in younger ones. **Leaves** very variable in size, lanceolate, glabrous above, sparsely hairy beneath, scabrous along the margins, acuminate at apex ending in a sharp twisted seta; **leaf-sheaths** striate, keeled, often hirsute. **Flowers** (spikelets) usually in pairs, mostly one flowered, in leafy panicles with spicate branchlets bearing 3 spikelets; **glumes** 2-3 empty and 1 fertile, ovate-acute and mucronate at apex; **palea** convolute, glabrous except for the ciliate point; **stamens** exerted with narrow, long, apiculate anthers, hairy at the tip; **pistil** with ovate-acuminate ovary, hairy style and 3 plumose, short stigmas. **Caryopsis** elliptic-oblong and mucronate at apex.

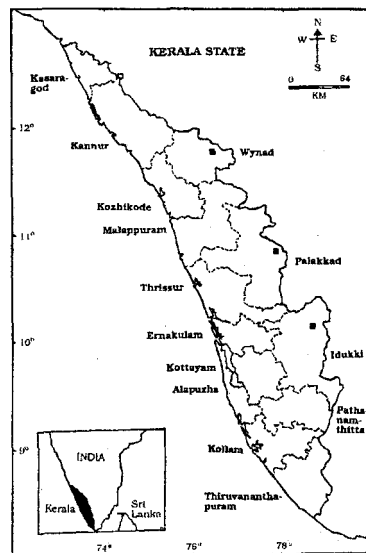
### Ecology

This reed-like bamboo is confined to grasslands of Kerala at elevations above 1000m. There are no data available on the flowering of the species in State and Blatter (1929) also failed to provide this data for the species, even though informations on location-wise phenology of most other bamboos of India, are provided.

### Distribution

Kerala

Wynad, Palghat, Idukki and southern



Map 116. Distribution of *Pseudoxytenanthera monadelpha* (Thw.) Sodes. et. Ellis in Kerala.

parts of Kerala (Gamble, 1896); confined to the high altitude grasslands of the State (Map 116).

#### World

Peninsular India in the Eastern and Western Ghats.

#### Notes

This endemic bamboo species of Peninsular India is included in the Manual on the authority of Gamble (1896) who had reported the occurrence of it in the hills of Kerala. No specimen could be examined and therefore the description and distribution details of the species provided here are based only on literature. This bamboo species has not been included in the enumeration of Krishnamurthy (1993).

#### Products and uses

Mature culms are suitable for fencing, thatching and basket making. This is also an ornamental bamboo (Anonymous, 1966). Leaves are also used for thatching (Gamble, 1896).

#### References cited

- Anonymous, 1966. *The Wealth of India: Raw Materials*. vol. 7. CSIR, New Delhi. p. 201.
- Blatter, E. 1929. Flowering of bamboos. *J. Bombay nat. Hist. Soc.* 33: 899-921.
- Gamble, J.S. 1896. The Bambusaceae of British India. *Ann. Roy. bot. Gardn. Calcutta* 7: 72-73. t. 64.
- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford IBH, New Delhi.

### 117. PSEUDOXYTENANTHERA RITCHEYI (MUNRO) NAITH. ( Bambusaceae )

#### Nomenclature

- Pseudoxytanthera ritcheyi* (Munro) Naith., *J. Bombay nat. Hist. Soc.* 87: 440. 1990; Tew., *Monogr. Bamb.* 127. fig. 1-5. 1992.
- Oxytanthera ritcheyi* (Munro) Blatt. *et* Mc Cann, *J. Bombay nat. Hist. Soc.* 33: 773. 1929; Verm. *et* Bah., *Indian For. Rec.* (n.s.) Bot. 6(1): 4. 1980.
- Bambusa ritcheyi* Munro, *Trans. Linn. Soc. London* 26: 113. 1868.
- Oxytanthera monostigma* Bedd., *Fl. Sylvat. South. Ind.* 233. 1873; Gamble, *Ann. Roy. bot. Gardn. Calcutta* 7: 74. t. 65. 1896 & in Hook.f., *Fl. Brit. India* 7: 402. 1896; Bourd., *For. Trees Trav.* 400. 1908; Rama Rao, *Fl. Pl. Trav.* 447. 1914; Fisch. in Gamble, *Fl. Presid. Madras* 3: 1861. 1934.

#### Local

Not known.

## Description

Erect, shrubby bamboos, upto 4 m high; **culms** almost solid, densely covered with pale yellow, velvety, deciduous tomentum with prominent nodes and 30-40 cm long and 2-3 cm across internodes; **culm-sheaths** upto 20 x 7 cm, broad at base, attenuate upwards, thin, striate, sparsely appressed, stiff-hairy; **ligules** long, fimbriate along the margins. **Leaves** variable, 15-20 x 2-4 cm, linear-lanceolate, glabrous above, scarios along the midrib and the margins, twisted setaceous at apex; **leaf-sheaths** striate, glabrous or scattered, appressed hairy, without apical calluses. **Flowers** (spikelets) upto 2.5 cm long in large terminal panicles of spicate branchlets bearing globular heads, one flowered, apiculate, spinous; **glumes** fertile and empty almost equal in number, ovate, mucronate; **palea** not keeled, blunt; **stamens** exerted, fused with upto 0.6 cm long anthers bristled and apiculate at apex; **pistil** with ovate acuminate glabrous ovary, long style and plumose stigma, curved in mature spikelets. **Caryopsis** linear-oblong, grooved, mucronate at apex.

## Ecology

A dense reed-bamboo habitated to high elevations, ie. above 1000 m, of Kerala. As reported by Blatter (1929) this bamboo has flowered in the Western Ghats during 1852, 1870, 1884, 1889. [In Kerala the species has flowered during the month of January 1979 in North (Cannanore) as observed from the specimens at MH.

## Distribution

Kerala

Cannanore, Palghat and Idukki districts; confined to the highlands (Map 117).

World

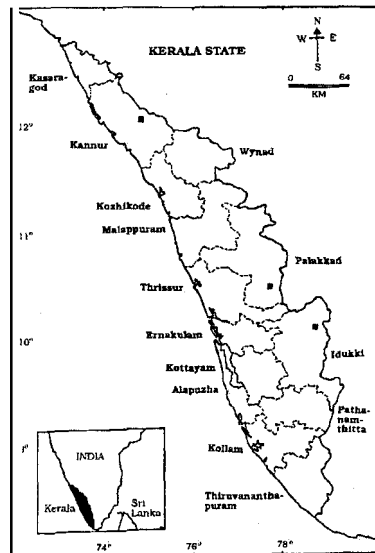
Peninsular India along the Western Ghats, extending upto Gujrat State.

## Notes

This endemic bamboo species of Peninsular India, has not been included in the list of non-timber forest products of India by Krishnamurthy (1993).

## Products and uses

The solid culms of this bamboo is used for fencing, making baskets, tent poles, walking sticks, umbrella handles, and as baton used by police and scout-men. Frames and map-stands are also made of this bamboo.



Map 117. Distribution of *Pseudoxytenanthera ritcheyi* (Munro) Naith. in Kerala.

### Regeneration

This light demanding bamboo species, habituated to exposed hill tops and mountain ridges, flowers at varied intervals. Natural regeneration of the species is by profuse seeding that takes place after gregarious flowering.

For artificial regeneration of the species, seeds can be collected from natural stands. About 7500-7800 seeds weigh one kilogram (Seethalakshmi and Muktheshkumar, 1998). The seeds can be stored for more than a year (Seethalakshmi, 1991) in dessicators or deep freezer, over anhydrous Calcium chloride. Initial viability of the seeds is around 70 percent. Shivanagi (1980) had given some details of a plantation trial of this bamboo species conducted in Karnataka State, South-India.

### References cited

- Blatter, E. 1929. Flowering of bamboos. *J. Bombay nat. Hist. Soc.* 33: 899-921.
- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi.
- Seethalakshmi, K.K., 1991. Propagation, Silviculture, Management and Utilization of Bamboos in Kerala. *KFRI Research Report* (unpublished).
- Seethalakshmi, K.K. and M.S. Muktheshkumar 1998. *Bamboos of India: A Compendium*. INBAR, Beijing and KFRI, Peechi. pp. 225-227.
- Shivanagi, N. V. 1980. Notes on plantations at Asoga. In: *Proceedings Third Southern Silviculturists and Forest Research Officers Conference*. Karnataka Forest Department, Dharward. pp. 127-131.

## 118. PTEROCARPUS MARSUPIUM ROXB. ( Papilionaceae )

### Nomenclature

*Pterocarpus marsupium* Roxb., Pl. Corom. t. 1799 & Fl. Indica 3: 234. 1832; Wt. et Arn., Prodr. 266. 1834; Bedd., Fl. Sylvat. South. Ind. t. 21. 1869; Baker in Hook.f., Fl. Brit. India 2: 239. 1876; Bourd., For. Trees Trav. 120. 1908; Rama Rao, Fl. Pl. Trav. 131. 1914; Gamble, Fl. Presid. Madras 1: 385. 1918; Rojo, Pterocarpus 58. 1972; Krishnam., Min. For. Prod. India 83, 223, 252, 357, 426, 482. 1993.

*Pterocarpus bilobus* Roxb. ex G. Don, Gen. Syst. 2: 376. 1831-38.

### Local

Chora-venga, Karinthakara, Malanthakara, Venga.

### Description

Semi-evergreen **trees**, 10-25 m high; **bark** corked, thick, yellowish grey;

**young leaves** reddish. **Leaves** alternate, imparipinnate, 5 to 7 foliate, 9.5-18 cm long; **rachis** upto 5 cm long, glabrous, prolonged beyond the insertion of the upper lateral leaflet; **leaflets** 5-10.5 x 3.8-6 cm, obovate, broadly obovate, elliptic, broadly ovate or rarely oblong, entire, coriaceous, glabrous, retuse or obtuse at apex, obtuse, truncate or cuneate at base, with close, prominent, parallel side-nerves; **stipules** small, deciduous; **petiolules** 0.6-1.1 cm long, stout. **Flowers** yellow, scented, upto 1.5 cm across in terminal, fusco-pubescent, paniculate racemes, shorter than the leaves; **pedicels** short, articulated below the flowers; **calyx** upto 0.7 cm long, campanulate, somewhat curved, brown-pubescent with very short, broadly triangular calyx teeth, the upper two lobes often connate and larger; **corolla** exerted, upto 1.2 cm long, with petals having crisped margins and long claws, vexillum upto 1.2 x 0.8 cm, orbicular, prominently nerved; **wing petals** upto 0.8 cm long, oblique, keel petals upto 1 x 0.5 cm, oblique, slightly connate towards apex; **stamens** 10, upto 0.8 cm long, monadelphous towards base with staminal tube often split along the sides making the stamens isodiadelphous (5+5); **pistil** upto 1 cm long, shortly stalked with ovary 2 to 6 ovuled, style upto 0.5 cm long, filiform, incurved, breadless and capitate stigma. **Pods** 3.5-5 x 3-3.8 cm, suborbicular, winged, stipitate, glabrous with veined wings; **seeds** one or rarely 2, oblong or subreniform.

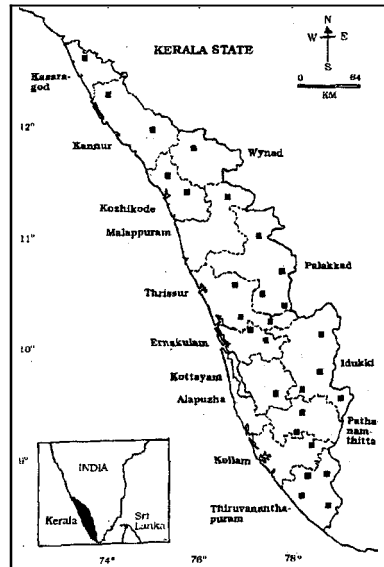
## Ecology

Densely foliated trees with often fissured bark exuding copious resin which dries into solid blocks. Flowering branches very showy and often visible from a distance. Trees common in and around grasslands, rocky forest fringes and along the sides of ravines. The tree flowers from May to October, maximum during October and occasionally during April and May. Fruits are produced during October to March, but mostly during October-November. As noted in the field, the flowering period of the trees is rather irregular.

## Distribution

### Kerala

Kasaragod, Cannanore, Wynad, Calicut, Malappuram, Palghat, Trichur, Ernakulam, Idukki, Kottayam, Pathanamthitta, Quilon and Trivandrum districts; throughout the State, from the mid to the highlands (Map 118).



Map 118. Distribution of *Pterocarpus marsupium* Roxb. in Kerala.

**World**

Peninsular India, Sri Lanka.

**Notes**

While enumerating species of *Pterocarpus* in India, Prain (1891) identified two varieties and two forms under each of the variety, namely:

var. a form 1. *biloba* form 2. *vera*  
var. b form 3. *acuta* form 4. *acuminata*

From the taxonomic characters given by Prain (1891), specimens of the species from Kerala belong to the var. a form *vera* with leaves elliptic or oblong, slightly noutched and obtuse or rarely subacute at apex. This form is reported only from South India in Nilgiris, Cunoor, North Arcot, Nellore, Carnatic, Cuddapah, Bellary, Kurnool, Krishna and Mysore (Prain, 1891). However, Cooke (1901) recognized only one variety under the species, namely var. *acuminata* Prain (1898) which is reported from Konkan and Canara regions of the erstwhile Bombay Presidency. Similarly, Gamble (1918) described the variety *canus* Gamble which again is based on a specimen of Beddome from the hills of Krishna District in Andhra Pradesh, characterized by branchlets, leaflets beneath, calyx and rachis white-silky pubescent, leaflets much smaller and small flowers in short racemes, as compared to the species proper.

**Products and uses**

Gum-kino or Malabar kino is the major non-timber forest product extracted from this tree. Incisions made into the bark upto the cambium layer promote the exudation of the gum which is collected and dried in shade. About 340 gm of dried gum is produced by one tree at a time. In some areas, extraction of the gum by damaging the bark is reported to be causing damage to the tree.

Gum-kino contains a non-glucosidal tannin, kinotanic acid (+20-80%), kinoin and kino-red, in addition to small quantities of catechol, protocatechnic acid, resin, etc. The therapeutic value of gum-kino is due to the presence of kinotanic acid which constitutes about 70-85% of the kino gum. Gum-kino is medicinally used as a simple astringent in the treatment of diarrhoea, tooth ache, and so on. Pieces of the heartwood of the tree, put in water overnight, and consumption of this solution is remedial for diabetes. Alternately, cups made of the heartwood of the tree is filled with water, kept overnight and taken (Krishnamurthy, 1993).

Bruised leaves and flowers of this tree are used in the treatment of boils,

sores and skin diseases. The bark of *Pterocarpus marsupium* contains I-epicatechin and a redish-brown colouring matter used in dyeing. The flowers are edible, and leaves are used as fodder and is an excellent green manure. Mixed with other woods, the timber of *Pterocarpus marsupium* is utilized in the manufacture of paper pulp.

### Production and marketing

One mature tree produces about 340 gm of dried gum, by making lections in the bark upto cambium level (Anonymous, 1969). There is no reliable figures available on the total production of the item from Kerala forests and also its market value as the item is not procured and marketed by the Kerala State SC & ST Federation (1998).

### Regeneration

The tree is a light demander and is frost and draught-tender. It coppices fairly well and pollarding capacity is better than the coppicing power. Naturally dispersed seeds in forest areas during April-June, germinate in the same rainy season. Partial burial of seeds in loose soil, removal of weeds and protection from draught can promote the survival and growth of seedlings. Grazing is also an adverse factor affecting the survival and growth of seedlings in natural forests.

Mature pods collected during February to May on sun-drying give away seeds which can be stored in gunny bags. However, for artificial regeneration, sowing entire pods with ripened seeds is the practice, and dried pods can also be stored upto 9 months. About 1590-1640 pods weigh one kilogram and germination percentage of seeds vary from 40-80 depending on the month of sowing. April-May is the ideal time for seed sowing (FRI, 1983), giving maximum germination. It takes 2-8 weeks for the seeds to germinate and cutting and soaking the ends of pods can further reduce the germination period. In the nursery, entire pods are dibbled in beds, 7.5 x 7.5 cm apart. Entire plants, after one year of growth in the nursery, can be field planted with a ball of earth retained around the roots or the seedlings can be made into stumps before planting. However, Kadambi and Dabral (1955) has reported that stump-planting is better, as compared to seed-sowing and transplanting entire seedling transplants. Nair, *et al.* (1991) had recently worked out the plantation and others related aspects of this tree species in much detail.

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- Kadambi, K. and S.N. Dabral 1955. Studies on the suitability of different methods of artificially regenerating forest species. *Indian For.* 81: 129-151.
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- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi. pp. 83-84, 482.
- Nair, K.K.N., K.C. Chacko, K.V. Bhat, A.R.R. Menon, George Mathew, Mohammed Ali and R.C. Pandalai 1991. Studies on Selected Indigenous Species for Future Plantation Programmes in Kerala. *KFRI Research Report*. KFRI, Peechi.
- Prain, D. 1891. Report on the Indian species of *Pterocarpus*. *Indian For* 26: Appendix 1-16.
- Prain, D. 1897. Some additional Leguminosae. *J. Asiat. Soc. Bengal* 66: 347-518.

**119. RAPHIDOPHORA PERTUSA (ROXB.) SCHOTT.**  
(Araceae)

**Nomenclature**

- Raphidophora pertusa* (Roxb.) Schott, Bonplandia 5:45. 1857 & Prodr. Syst. Aroid. 382. 1860; Baker in Hook. f., Fl. Brit. India 6: 546. 1893; Rama Rao, Fl. Pl. Trav. 427. 1914; Fisch. in Gamble, Fl. Presid. Madras 3: I 109. 1928.
- Pothos pertusus* Roxb., Fl. Ind. 1:455. 1820; Wt., Ic. Pl. Ind. Orient. t. 781, 1844.
- Monstera pertusa* (Roxb.) Schott, Wiener Z. Kunst 1830: 781. 1830.
- Scindupsus pertusus* (Roxb.) Schott in Schott & Endl. Melet., Bot. 21. 1832; Wt., Ic. Pl. Ind. Orient. t. 781. 1844.

**Local name(s)**

Athithippali, Anachukiri, Hattimaravala, Anatippali.

**Description**

Climbing **shrubs**; **stems** thick, dark green, rooting at nodes. **Leaves** alternate, distichous, broadly elliptic or ovate, pinnatipartate or entire, variously perforated or some times pinnatifid on one side to near the base and perforate on the other or more rarely completely pinnatifid to near the midrib, 15-28 x 12-26 cm, shortly cuspidate at apex; **lobes** few, unequal, dilated towards the oblique-falcate-acuminate margin; **petioles** 15-30 cm long, not winged but almost sheathing at base, deeply channeled above; **Flowers** bisexual, axillary, on stout peduncles, upto 5 cm long with spathe yellowish



green, 10-14 x 5-7 cm and spadix 7-10 cm long; **petals** 0; **stamens** 4. anthers shorter than filaments; **pistil** with truncate, many ovuled, almost 2-locular ovary, short or elongate, conical-shaped style and sessile, pulvinate stigma. **Berries** confluent and pericarp with intercellular needles; **seeds** oblong with copious albumen and axile embryo.

### Ecology

Common in evergreen and semievergreen forests, mostly as climbers along hedges and other low supports. It also grows as epiphytes, much reduced in size. The plants flower and fruit mostly during April to December.

### Distribution

Kerala

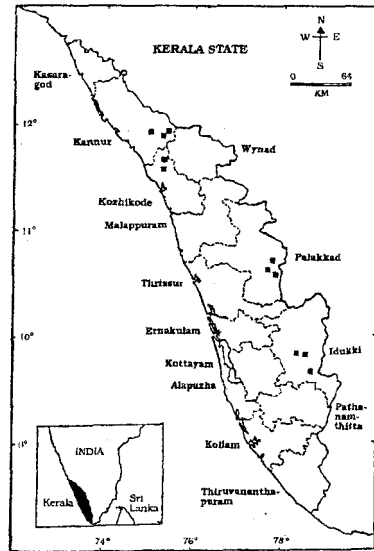
Cannanore, Calicut, Palaghat and Idukki Districts (Map 119).

World

India and Sri Lanka.

### Products and uses

The juice of the plant, mixed with black pepper, is given as an antidote for biting of snake (Russell's viper). Also, the juice along with that of the roots of *Croton oblongifolium* Roxb. and of the fruits of *Memordica charantia* L. is externally applied to the snake-bitten part as a remedy. The dried inflorescence of the plant is acrid, sweet, thesmogenic, stimulant, aphrodisiac, expectorant, diaphoretic, carminative and anthelmintic. It is useful in vitiated conditions of vata and kapha, diarrhoea, cough, bronchitis, pharyngopathy and helminthiasis. (Warier, *et al.* 1996).



Map 119. Distribution of *Raphidophora pertusa* (Roxb.) Schott in Kerala.

### Production and marketing

Athithippali, often available in the market, is the sliced and dried inflorescence of *Balanophora indica* Wall. (a root parasite belonging to the family Balanophoraceae), as an adulterant or substitute (Sivarajan and Balachandran, 1994). In practice, the stem of *R. pertusa* is cut into pieces, dried in sun and is mixed with that of *B. indica* and marketed as the drug material.

### References cited

- Sivarajan, V.V. and I. Balachandran 1994. *Ayurdic Drugs and Their Plant Sources*. Oxford & IBH, New Delhi. p. 376.
- Warrier, P.K., V.P.K. Nambiar and C. Ramankutty (eds.) 1996. *Indian Medicinal Plants*. vol. 5. Onent Longman, Madras. pp. 92-95.

## 120. RAUVOLFIA SERPENTINA (L.) BENTH. EX KURZ ( Apocynaceae )

### Nomenclature

- Rauvolfia serpentina* (L.) Benth. ex Kurz, For. Fl. Burma 2:171. 1877; Hook.f.in Hook.f., Fl. Brit. India 3: 632. 1882; Rama Rao, Fl. Pl. Trav. 251. 1914; Gamble, Fl. Presid. Madras 2: 807. 1923; Monach.;Eco. Bot. 8: 349-65. 1954; Markgraf, Blumea 30: 161. 1984; Nicol. *et al.*, Intrap. Hort. Malab. 57. 1988; Krishnam., Min. For. Prod. India 4, 8, 84. 1993.
- Ophioxylon serpentinum* L., Sp. Pl. 1043. 1753; Wt., Ic. Pl. Ind. Orient. t. 849. 1844-45.
- Ophioxylon trifoliatum* Gaertn., Fruct. 2: 123. 1791.

### Local name(s)

Amalpori, Chuvanna-amalpori, Sarpagandhi, Suvapaval-porayan.

### Description

**Undershrubs**, 60-90 cm high; **branchlets** glabrous, subterete, crowded-leafy at apex. **Leaves** simple, whorled, 5-14 x 3-7 cm, oblanceolate or obovate, membranous, glabrous, cuneate at base, acuminate at apex; **petioles** 0.3-1.2 cm long, slender, glabrous. **Flowers** white tinged with violet, in 5-8 cm long, terminal corymbose cymes with short pedicels; **calyx** 0.1-0.3 cm long, lobed with 1 or 2 minute teeth; **corolla** upto 1.5 cm long, tubular, inflated above the middle, obliquely suborbicular, upto 0.3 cm long lobed, pilose inside the tube from the middle to the mouth; **stamens** inserted in the inflated part of the corolla tube with shortly ovate anthers, upto 0.2 cm long; **pistil** upto 1.5 cm long, with ovate or rounded ovary almost 0.2 cm long, style about 0.5 cm long and calyptiform stigma. **Merocarps** purplish black, 0.5-0.8



Fig. 35. *Rauvolfia serpentina* (L.) Benth. et Kurz

cm long, connate in the lower half, glabrous, minutely apiculate at apex; seeds upto 0.5 cm long, ovate (Fig. 35).

### Ecology

Rather common undershrubs forming part of the undergrowth in moist deciduous forests, especially along forest path sides and open areas. The plant is also in cultivation. Flowers are produced during May-June and by August-September fruits mature.

### Distribution

#### Kerala

Cannanore, Wynad, Calicut, Malappuram, Palghat, Trichur, Ernakulam, Idukki, Kottayam, Pathanamthitta, Quilon and Trivandrum districts; almost throughout the State from mid to highlands (Map 120).

#### World

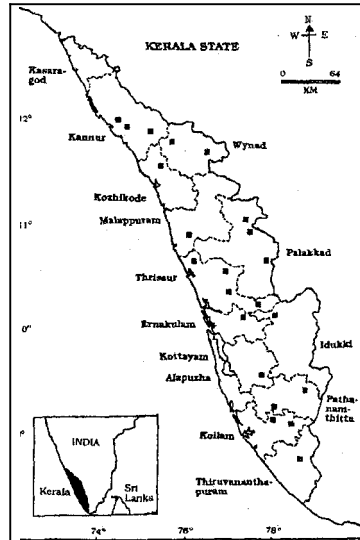
India, Sri Lanka, Thailand, Indo-China, South Yunan and Malasia.

### Products and uses

Roots of the plant are extensively extracted as source of the alkaloids reserpine, serpentinine, deserpidine, ajmaline, rauwolfinine, etc. of which the first one is highly medicinal as a nervous depressent, causing sedation and lowering of hypertension accompanied by bradycardia. The drug, administered in the form of root powder or its extract, is also remedial for a number of diseases like psoriasis, gynecological disorders, toxic goitre, mental disorders, and so on (Krishnamurthy, 1993). The alkaloid yield is relatively more when the plants are harvested when they are leafless. Several preparations containing *Rauwolfia* are sold in the market in various trade names. In small quantities, stem and leaves of the plant also contain the alkaloids. Seeds of the plant are also medicinal- as an antidote against scorpion and snake bite. Krishnamurthy (1993) had given different aspects of cultivation of this species, which is much prevalent, due to the dwindling supply of the required quantity of products from its natural sources.

### Production and marketing

The species is both in wild and cultivation and the product extracted is the roots of the plant. The per plant yield of roots vary from 1 to 4 kg (Anony-



Map 120 Distribution of *Rauwolfia serpentina* (L.) Benth et Kurz in Kerala

mous, 1969). From the wild, the Kerala State SC & ST Federation (1998) transacted about 1283 kg of the roots during 1994-95 to 1996-97 at a procurement cost of Rs. 98.00 and disposal rate of Rs. 100.00 per kilogram. Both the roots and the alkaloid extracted from it are also exported from India. Shiva, *et al.* (1996) had recorded the export of 4 tonnes of the roots during 1980-81, fetching an amount of Rs. 47,000.00. Also *Rauvolfia* alkaloid to the tune of 786 kg and 566 kg were exported from India (Anonymous, 1969) during 1966-67 and 1967-68, at a cost of Rs. 87,415.00 and Rs. 43,184.00, respectively.

### Regeneration

The plant can be propagated from seeds, roots cuttings, root stumps and stem cuttings (Anonymous, 1969). Direct sowing of the seeds is reported to be not successful and nursery-raised seedlings are preferred for planting. Moreover, viability of the seeds is also rather poor varying from 25-50% or sometimes even less than 10 percent. Therefore, vegetative propagation by root or shoot cuttings is often practiced for the artificial regeneration of the species. Taproots with thin lateral roots, cut into 2.5-5cm long pieces are planted horizontally about 5 cm below the soil surface or erect at the same depth. Also, root-stumps with 5 cm long root portion and the collar portion retained, when planted, had given 90- 100% success (Anonymous, 1969). Woody stem cuttings have also been tried for the propagation of the plant.

### References cited

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- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi. pp. 85-86.
- Shiva, M.P., S. Aswal, A. Sharma, P. Mathur and R. Chandra 1996. *Trends of Export and Import of the Minor Forest Products in India*. Centre for Minor Forest Products, Dehra Dun. 38 p.

## 121. ROTULA AQUATICA LOUR. (Ehretiaceae)

### Nomenclature

- Rotula aquatica* Lour., Fl. Cochinch. 121. 1790; Gamble, Fl. Presid. Madras 2: 893. 1923; Johns., J. Am. Arbor. 32: 15. 1951.
- Rhabdia lycioides sensu* Clarke in Hook.f., Fl. Brit. India 4: 145. 1883 (*non* Mart., 1827); Rama Rao, Fl. Pl. Trav. 273. 1914.
- Ehretia cuneata* Wt., Ic. Pl. Ind. Orient. t. 1385. 1848.

**Local name(s)**

Kalur-vanchi.

**Description**

**Undershrubs**, upto 75 cm high; **branchlets** twiggy, often prostrate, reddish or green. **Leaves** simple, alternate or clustered, 1.5-2.5 x 0.5-1 cm, oblong to obovate or linear-oblong, entire or shallowly toothed, glabrescent or sparsely scabrous, ciliate along the margins, cuneate at base, obtuse or shortly apiculate at apex; **petioles** upto 0.3 cm long, greenish. **Flowers** pink or purplish, solitary or aggregated in terminal or axillary branchlets, solitary or in few-flowered racemes; **calyx** with 5 sepals, upto 0.6 x 0.2 cm, lanceolate, ciliate along the margins, acuminate at apex; **corolla** upto 0.6 cm long, 5-lobed, with broadly elliptic-oblong, obtuse lobes; **stamens** 5, exerted at the base of the corolla tube, with filaments upto 0.3 long and oblong-ovate anthers almost 0.2 cm in length; **pistil** with oblong-globose ovary upto 0.1 cm long, 0.2-0.4 cm long style and capitate stigma. **Drupe**s with 4 crustaceous, 1-seeded pyrenes, upto 0.4 cm across; **seeds** oblong, albuminous.

**Ecology**

Very woody, much branched shrubs with spreading root system often attached to crevices of rocks, with thin layer of water flowing above. The plant can withstand submersion under flowing water for quite some time and they are always confined to river beds and rocky substratum. Flowers and fruits are produced during August to November, just after the South-West monsoon.

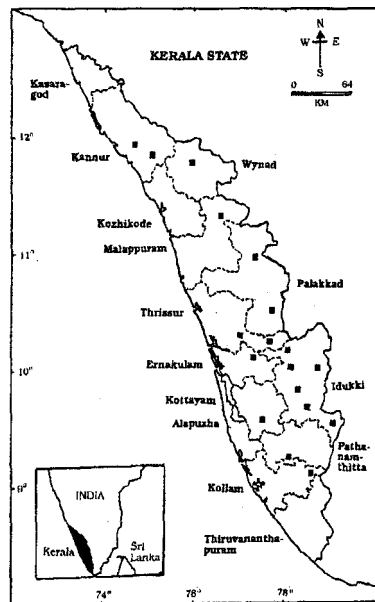
**Distribution**

Kerala

Cannanore, Wynad, Malappuram, Palghat, Trichur, Ernakulam, Idukki, Kottayam, Pathanamthitta and Quilon districts; almost throughout the State, mainly in the hilly uplands and highlands (Map 121).

World

South-East Asia.

Map 121 Distribution *Rotula aquatica* Lour in Kerala**Notes**

*Rotula lycioides* Mart. (1827), synonymous with *Rhabdia lycioides* Mart., is confined to tropical West Africa and eastern Brazil and does not occur in

India. Therefore, the plant that is given under the name in Indian Floras has to be treated as a separate species for which *Rotula aquatica* Lour. is the correct name. This species of high medicinal value, habituated to the natural forests of Kerala, is an addition to Krishnamurthy's (1993) work on the non-timber forest products of India.

### Products and uses

Roots which contain Rhabdiol is highly medicinal, especially in the treatment of piles, kidney and bladder stones and venereal diseases. The plants, confined to river beds, are indiscriminately extracted for medicinal purposes and also for split stem used as ropes.

### Reference cited

Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi.

## 122. RUBIA CORDIFOLIA L. ( Rubiaceae )

### Nomenclature

*Rubia cordifolia* L., Mant. Pl. 197. 1767 & Syst. Nat. (ed. 12) 3: 229. 1968; Wt. et Arn., Prodr. 442. 1834; Wt., III. Ind. Bot. t. 128. fig. 1. 1850 (*proparte*); Hook.f. in Hook.f., Fl. Brit. India 3: 202. 1881; Rama Rao, Fl. Pl. Trav. 218. 1914; Gamble, Fl. Presid. Madras 2: 655. 1921; Deb et Mallick, Bull. bot. Surv. India 10: 6. 1968; Verdc., Kew Bull. 30: 322-23. 1975; Krishnam., Min. For. Prod. India 341, 358, 359. 1993.

*Rubia munjista* Roxb., Fl. Indica I: 383. 1820; Wt., Ic. Pl. Ind. Orient. t. 187. 1839.

*Rubia scandens* Zoll. et Merr. in Miq., Fl. Ind. Bat. 2: 338. 1856.

### Local name(s)

Manchatti, Mangishta, Shivali-kodi.

### Description

Straggling or climbing **herbs**, 1-2 m high; **branches** quadrangular, hispid with long internodes. **Leaves** simple, often 4 in a whorl, 1-7.5 x 1-3 cm, entire, palmately veined, scabrid or hairy, cordate or rarely rounded at base, acuminate or acute at apex; **petioles** 3-7 cm long, hispid or hairy. **Flowers** greenish-white, pinkish, yellowish or purplish, in axillary or terminal paniced, trichotomous cymes with long, scabrid peduncles; **pedicels** 0.2-0.4 cm long, terete, scabrid; **calyx** adhering to the globose ovary, not lobed; **corolla** gamopetalous, 5-lobed, upto 0.3 cm long, with lanceolate, acute lobes; **stamens** 5, epipetalous, with filaments upto 0.7 cm long and oblong, basifixed

anthers at the throat of the corolla tube; **pistil** bicarpellary, syncarpus, with basally united, 0.3-0.6 cm long style and globose stigma. **Fruits** purplish-black, upto 0.4 cm across, globose or didymous; **seeds** albuminous.

### Ecology

Herbaceous stragglers, often spreading on the top of bushes in the open forest floor, especially in moist deciduous forests and scrubjungles. Flowers mostly produced during February to December and fruits during March to January, ie. the plant is either in flowers or in fruits almost throughout the year.

### Distribution

#### Kerala

Cannanore, Wynad, Calicut, Malappuram, Palghat, Trichur, Idukki, Kottayam and Pathanamthitta districts; almost throughout the State, mainly in the hilly uplands and highlands (Map 122).

#### World

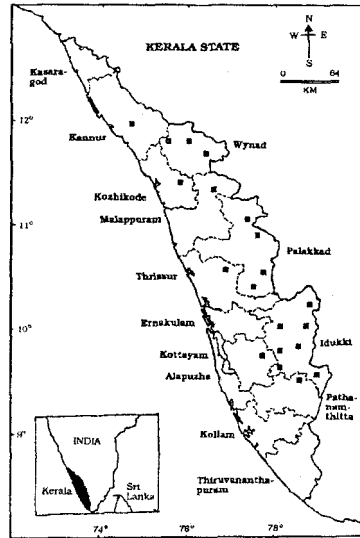
India, Sri Lanka, Myanmar, Bhutan, Sikkim, Tibet, Nepal, Pakistan, Afghanistan, Indo-China, Java, Japan, Korea, Malacca, China, Russia, North-East Asia and tropical Africa.

### Notes

The species is highly variable and accordingly, based on Indian collections, Deb and Mallick (1968) had recognised var. *cordifolia*, var. *cordifolia* forma *strigosa* and var. *hasiana* Watt. Of them, the specimens examined from Kerala belongs to the typical variety. The other two variants are confined to North-East India.

### Products and uses

As a source of dye and for medicinal use the plant is exploited. The root-stock and roots of the plant constitute the Indian Maddar of commerce. The colouring matter Purpurin and Manjustin contained in the root and stem of the plant is used for dyeing cotton fabrics, blankets, carpets, etc. imparting bright scarlet or munjustin shade, with alum as the mordant (Krishnamurthy, 1993). Roots and leaves are highly medicinal and root extract is used in the preparation of the drug Septilin used in the treatment of rhinosinal infections.



Map 122 Distribution of *Rubia cordifolia* L. in Kerala.

**References cited**

- Deb, D.B. and K.C. Malick 1968. Revision of the genus *Rubia* L. in India and adjoining regions. *Bull. bot. Surv. India* 10: 1-16. fig. 9.
- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi. p. 359.

**123. SAMADERA INDICA GAERTN.**  
( **Simaroubaceae** )

**Nomenclature**

- Samadera indica* Gaertn., Fruct. 2: 352, t. 156. f. 3. 1791; Wt. *et* Arn., Prodr. 151. 1834; Wt., III. Ind. Bot. t. 68. 1840; Benn. in Hook.f., Fl. Brit. India 1: 519. 1875; Bourd., For. Trees Trav. 66. 1908; Rama Rao, Fl. Pl. Trav. 68. 1914; Gamble, Fl. Presid. Madras 1: 163. 1915; Basak, Fasc. Fl. India 4: 15. 1980; Krishnam., Min. For. Prod. India 446,457. 1993.
- Quassia indica* (Gaertn.) Nooteb., Blumea 11: 517. 1962; Nicol. *et al.*, Intrap. Hort. Malab. 245. 1988.

**Local name(s)**

Karinjotta, Karinthakara, Njota.

**Description**

**Trees**, 6-10 m high; **branchlets** stout. **Leaves** simple, alternate, 15-25 x 5-7 cm, elliptic or oblong, entire glabrous and shiny above, rounded or subacute at base, shortly acuminate at apex; **petioles** 1-2 cm long, stout, glabrous. **Flowers** yellowish-green or yellowish-red in axillary umbels on long, drooping peducles, pedicellate; **pedicels** 1-2 cm long, glabrous, reddish; **calyx** upto 0.2 cm long, 3-5 lobed, glabrous, persistent, often ciliate along the lobes; **corolla** 2-2.5 cm long, with oblong, obtuse, glabrous petals; **stamens** double the number of petals with filaments upto 2 cm long, filiform, and oblong anthers; **pistil** with 4-loculed, shortly stalked ovary and glabrous style longer than the stamens, and acute stigma. **Drapes** red, 4-8 cm long, semicircular, compressed, smooth, reticulate, narrowly winged, I-seeded; **seeds** 2.5-3.5 x 1.5 cm, ovate, smooth.

**Ecology**

Stunted trees, rather common in evergreen, semi-evergreen and moist deciduous forests, sometimes planted along hedges, especially in central Kerala. The plant grows well in low areas and along backwater and river banks, especially in sandy areas. Flowers during February-March and fruits ripen by May-June.



## Distribution

### Kerala

Kasaragod, Cannanore, Wynad, Calicut, Malappuram, Palghat, Trichur, Ernakulam, Quilon and Trivandrum districts; almost throughout the State (Map 123).

### World

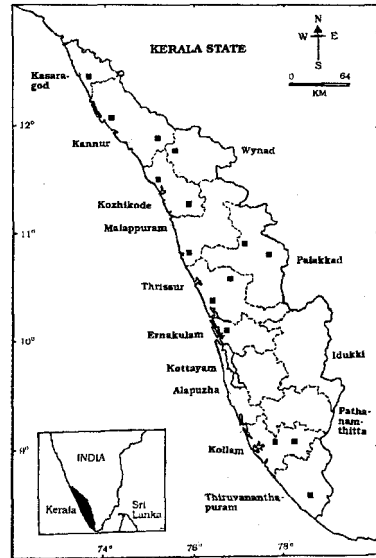
Malagasy, Sri Lanka, India, Myanmar, Malesia, Cambodia, Thailand, Laos, Vietnam, Indonesia, Philippines, Solomon Islands.

## Notes

Nootboom (1962), following Pierre (Bull. Mens. Soc. Linn. 156. 1896), treated *Samadera* Gaertn. as congeneric with *Quassia* L., whereas Basak (1980) considers *Samadera* as a genus distinct from *Quassia*, giving valid reasons. The concept of Basak (1980) is accepted here in treating the species under the genus *Samadera*.

## Products and uses

This tree is the source of Niepa bark of commerce, containing the bitter principle Samaderin. The bark and wood is used as febrifuge, stomachic and emmenagogue. Seeds are also medicinal as emetic, purgative, bilious, etc. and the golden yellow oil extracted from kernels of seeds is curative of rheumatism. Infusion of leaves is reported to possess insecticidal properties, especially to eradicate termites, lice and fleas (Krishnamurthy, 1993). Locally, the seeds are reported to be used as neck-laces by children with the belief that it can prevent chest diseases and asthma.



Map 123 Distribution of *Samadera indica* Gaertn. in Kerala

## References cited

- Basak, R.K. 1980. Simaroubaceae and Balanitaceae. In: *Fascicles of Flora of India*. No. 4. Botanical Survey of India, Calcutta. pp. 15-16.
- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi. pp. 446, 457.
- Nootboom, H.P. 1962. Generic delimitation in Simaroubaceae tribus Simaroubeae. *Blumea* 11: 517.

124. SANTALUM ALBUM L.  
( Santalaceae )

**Nomenclature**

*Santalum album* L., Sp. Pl. 349. 1753; Bedd., Fl. Sylvat. South. Ind. t. 256. 1872; Hook.f. in Hook.f., Fl. Brit. India 5: 231. 1886; Bourd., For. Trees Trav. 312. 1908; Rama Rao, Fl. Pl. Trav. 883. 1914; Gamble, Fl. Presid. Madras 2: 1262. 1925; Bhattn., Bull. natn. bot. Gardn. Lucknow 112: 1-90, tab. 21. 1965; Krishnam., Min. For. Prod. India 4, 109, 143, 405. 1993.

**Local name(s)**

Chandanam, Chandanamaram.

**Description**

Partly parasitic **trees**, 3-5 m high; **branchlets** slender, glabrous, often angled. **Leaves** simple, opposite below, alternate above, 1.5-8 x 1.5-3 cm, elliptic or ovate, entire, subcoriaceous, obtuse or acute at base, acuminate at apex; **petioles** 1-1.5 cm long, slender, glabrous. **Flowers** brownish-purple, reddish-purple or violet in terminal and axillary **trichotomous paniculate cymes**, about 4 cm long; **perianth** equally 3-lobed, basally connate into a **campanulate tube**, minutely ciliate, acute at apex sta-



Fig. 36. *Santalum album* L.

**mens** 5 with short filaments and ovate, parallel-loculed anther lobes of equal size; **pistil** with globose, 2-3, pendulous ovuled ovary, elongated style and 2-3-lobed stigma. **Drupes** bluish or purplish-black, 0.5-0.8 cm across, subglobose; **seeds** globose or obovoid (Fig. 36).

**Ecology**

The dry deciduous forests of Marayur near Munnar and Jasper and Thirumalai hills near Trivandrum are the natural habitats of the tree in Kerala which also grows in moist and dry deciduous forests of almost all the districts of the State. Flowers are produced during December to February and fruits mature by April-May.

**Distribution**

Kerala

Kasaragod, Cannanore, Wynad, Calicut, Malappuram, Palghat, Trichur, Idukki, Kottayam, Quilon and Trivandrum districts; almost throughout the State, as natural or cultivated (Map 124).

World

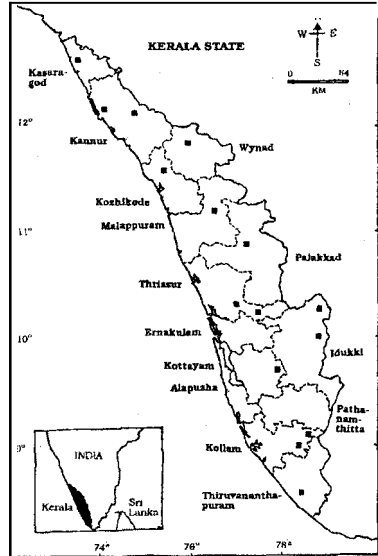
Peninsular India.

**Notes**

Sandalwood trees grow naturally just like a plantation in Marayur Range of Munnar Forest Division in Kerala.

**Products and uses**

The scented heartwood portion of the tree is the sandal wood of commerce, used mainly for the extraction of sandal wood oil. The ail is extensively used in perfume and soap industries and is also a fixative for floral essences. Oil content is reported (Krishnamurthy, 1993) to be maximum in the root portion. The wood is chipped and converted into small billets and then distilled to extract the oil, and the yield of oil ranges from 4.5-6.5%. Distillation is done under low pressure for 48-72 hours. The oil collected in a condenser is further purified for various uses. The major constituent of sandal wood oil is santal which blends easily with other essential oils.



Map 124 Distribution of *Santalum album* L. in Kerala

Sandal wood is also made into paste and used for religious purposes and as medicine for head-ache, fever, local inflammations and skin diseases. Sandal wood oil is also (Chopra, *et al.* 1956) used in symptomatic treatment of dysuria, venereal diseases, etc. Sankaranarayana (1980) had reported that an extract of bark in triterpenoid is an inhibitor of the growth of some insects and bacteria. As recorded by Rama Rao (1914), the root decoction is also useful to purify blood, bioliousness and in the treatment of leprosy and worms. Seed oil, thicker than castor oil, is also medicinal used in the treatment of skin diseases (Anonymous, 1972). Also, the oil dissolved in benzene is an ideal base for insulation or sticky tapes. Resins, darnmer or copal are mixed with the sandal wood oil to produce a bright orange-coloured varnish. The oil extracted from the endosperm of seeds is also edible.

In handicraft and incense industries, sandal wood is much used. It is mainly the saw dust of the wood which is put into the manufacture of incenses.

### **Production and marketing**

Products from Sandal trees are marketed as logs, wood chips, wood powder and wood (including main roots)-oil. Being a tree, growing naturally but almost maintained as a plantation in the Marayur area of Munnar Division, Kerala State, they are well protected, and therefore, the yield is almost sustained. Wood-chips and sandal powder worth Rs. 15.4 million and Rs. 311.1 million were traded from India, during 1980-81 and 1990-91, respectively. (Shiva, *et al.*, 1996). The quantum of material sold is around 732.5 tonnes during 1980-81 and 4281 tonnes in 1990-91. Sandalwood oil to the tune of 37.6 tonnes and 37.4 tonnes were also exported from the country during the two years, at the costs of Rs. 29.6 million in 1980-81 and Rs. 132.75 million during 1990-91. A major share of the various sandal products are also used in India itself in soap and perfume industry, and the important source of the products are the natural forests of Karnataka and Kerala in South India. Being a major non-wood forest produce, the Kerala State SC&ST Federation (1998) is not dealing with the item, which is directly auctioned by the Forest Department of the State.

### **Regeneration**

Sandal trees are habituated to the dry deciduous forest tracts of Kerala and is not tolerant to overhead shade. Natural regeneration of the species is by seeds and root suckers. Birds help in the dispersal of seeds and in moist soil with vegetation cover, they germinate during the rainy season. Important cultural operations for better natural growth of the trees are maintenance of natural host plants, irradiation of weeds, protection of seedlings from draught and sun-scorch by lateral shading, provision for adequate drainage and space for expansion of the tree crown (Luna, 1996).

Artificially, the tree can be regenerated by dibbling seeds under bushes and on mounds, transplanting nursery raised seedlings and by planting cuttings of root suckers (Rai and Kulkarni, 1986). Fruits which ripen during October-November can be collected from the ground as and when they fall. The pulp of fruits may be removed by rubbing in water and seeds dried and stored in polythene or gunny bags. About 6000 seeds weigh one kilogram. The seeds have a dormancy period of about 2 months and are viable for about 9 months (Nagaveni and Srimathi, 1981.) After the dormancy period, the seeds take about 50-100 days to germinate and about 80% of germination is reported (Luna, 1996) in laboratory and 60% in field conditions. In the nursery, seeds can be sown during May. The germination percent is 25-30 and plant percent is about 15. Seedlings with 4-6 leaves can be pricked and

poly-potted along with one or two seeds of *Cajanus cajan*, the primary host of this root-parasite tree. The seedlings may be allowed to grow in pots for 6-8 months, when they attain about 30cm height, ready for field-planting. In the field, seedlings can be planted in pits of 50x50x50 cm dimension, at a distance of 3 metres (Luna, 1996) with the host plants also planted in the same or nearby pits. The transplanted seedlings need protection from fire and grazing. Direct sowing of seeds and planting of root cuttings and root suckers are also other methods to artificially regenerate the species.

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- Sankaranarayana, K. H. 1980. Insect growth inhibitor from the bark of *Santalum album*. *Phytochem.* 19: 1239-1540.
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## 125. SAPINDUS TRIFOLIATA L. ( Sapindaceae )

### Nomenclature

*Sapindus trifoliata* L., Sp. Pl. 367. 1753; Bedd., Fl. Sylvat. South. India t. 154. 1871; Hiern in Hook. f., Fl. Brit. India 1: 682. 1875; Bourd., For. Trees Trav. 97. 1908; Rama Rao, Fl. Pl. Trav. 95. 1914; Nicol. *et al.*, Intrap. Hort. 237. 1988.

*Sapindus laurifolia* Vahl, Symb. Bot. 3: 54. 1794 (*nom. illeg.*, incl. type of *S. trifoliata* L.); Wt. et Arn., Prodr. 111. 1834; Gamble, Fl. Presid. Madras 1: 250. 1918; Mukh., J. Eco. Tax. Bot. 1: 81. 1980.

*Sapindus emarginatus* Vahl, Symb. Bot. 3: 54. 1794; Gamble, Fl. Presid. Madras 1: 250. 1918; Krishnam., Min. For. Prod. India 432, 435. 1993.

### Local name(s)

Pasakotta, Urulingi.

### Description

Trees, upto 20 m high; **bark** grey. **Leaves** abruptly 5 or 6 paripinnate or imparipinnate, alternate; **leaflets** subopposite or opposite, 5-16 x 2-9 cm, lanceolate or elliptic-lanceolate, entire, glabrous above, pubescent or subglabrous beneath, acute at base, acuminate at apex; **petiolules** upto 0.3 cm long, pubescent. **Flowers** pale white or greenish-yellow in rusty-pubescent terminal panicles with numerous male flowers and a few bisexual ones; **calyx** upto 0.3 cm long with 5 rounded-ovate, ciliolate, sepals, pubescent externally; **corolla** with 4-5 shortly clawed, narrow, lanceolate, villous petals upto 0.5 cm long; **stamens** 8, with villous filaments and oblong or ovoid, apiculate anthers; **pistil** with densely hairy trigonous ovary and tomentose, 3 lobed stigma. Fruits 2-3 lobed, fleshy, fulvous-hairy when young, glabrous and wrinkled when mature; **seeds** black, one in each lobe of the fruit, hard and smooth (Fig. 37).



Fig. 37. *Sapindus trifoliata* L.

### Ecology

Graceful trees, rather common in the evergreen, moist deciduous and open forest areas, and also growing in the coastal belt of the State. The tree is in bloom during December to April and fruits mature during March, April and May.

### Distribution

Kerala

Cannanore, Wynad, Calicut, Malappuram, Palghat, Trichur, Ernakulam, Idukki, Kottayam, Pathanamthitta, Quilon and Trivandrum districts; almost throughout the State, mainly in the hilly uplands and highlands (Map 125).

**World**

India. Sri Lanka.

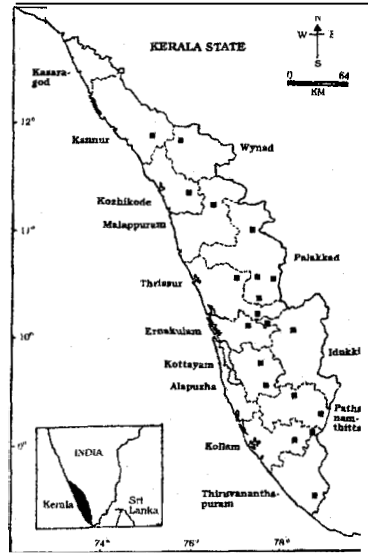
**Notes**

Vahl (1794) considered the Linnean specific epithet *trifoliata* as inappropriate for the species, because the plants bear paripinnate leaves with more leaflets. Therefore, the specific epithet was changed as *laurifolia* which is not in accordance with the International Code of Botanical Nomenclature (1988) and therefore the binomial *S. trifoliata* is used here as the correct name of the species.

*Sapindus emarginata* Vahl is considered as a distinct species by Gamble (1918). However, this being a work concerned with products, they are treated as one and the same, as the product remains the same.

**Products and uses**

This is the South Indian Soap Nut tree, the pericarp of the fruits of which is antiparasitic, used as detergent of skin, promoting its best function (Krishnamurthy, 1993). It is also commonly used as hair-wash, to clean other materials and for polishing gold and silver ornaments. The pericarp is rich in saponin, accompanied by a dark coloured matter possessing an unpleasant taste. The saponin can be used in brewery along with quillai and other materials. Krishnamurthy (1993) has elaborated the method of extraction of saponin and its marketing details along with propagation methods to multiply the trees. Root, bark and fruits of the plant are extracted for various, native medicinal uses and the seeds contain almost 45% of an oil used in soap industry and as a source of oleic and arachidic acids. Seed shells yield a dye used to colour cloth, leather and wood. The wood of the tree, even though not durable, is decorative and is much used in turnery and cabinet making. Root bark is a fish poison and honey from flowers is reported to be poisonous to bees.



Map 125 Distribution of *Sapindus trifoliata* L. in Kerala.

**Production and marketing**

Soapnut is both domestically used and also exported. During 1994-45 to 1996-97, the Kerala State SC & ST Federation (1998) received a total of 36307 kg of soapnut through its network of tribal societies all over Kerala. The cost

of the nut was fixed as Rs.7.00 per kg during that period. Also, during 1980-81, about 20 tonnes of the item was exported from the country and this was increased to 42 tonnes during 1990-91 (Shiva, *et al.* 1996).

### Regeneration

The tree naturally regenerates from seeds fallen on the ground in favourable conditions and artificial regeneration can also be done by sowing of seeds with or without pericarp. The ripened fruits can be collected during February-May by sweeping the floor when they fall on the ground. They can be sun-dried and stored in gunny bags. It is likely that the seeds can be stored for about an year without losing much viability, even though no data is available on this aspect. About 2000-2500 seeds weigh one kilogram and germination percentage is about 67 (FRI, 1981) with the plant percent about 62. Untreated seeds give better germination than cold or hot water treated samples. Successful regeneration of the tree by root suckers is also reported (FRI, 1981) and trenching around the mother trees is done for the production of root suckers. Also, the tree can be easily regenerated by direct sowing of seeds (Luna, 1996).

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## 126. SARACA ASOCA (ROXB.) WILDE (Caesalpinaceae)

### Nomenclature

*Saraca asoca* (Roxb.) Wilde, *Blumea* 15: 393. 1968; Zuijder., *Blumea* 15: 422. 1968; Nicol. *et al.*, *Intrp. Hort. Malab.* 142. 1988.



*Jonesia asoca* Roxb., Asiat. Res. 4: 355. 1799; Wt. et Arn., Prodr. 284. 1834; Wt., Ic. Pl. Ind. Orient. t. 206. 1839.

*Saraca indica auct non* L. (1769); Bedd., Fl. Sylvat. South. India 1: 57, t. 57. 1869; Baker in Hook.f., Fl. Brit. India 2: 271. 1878; Prain, J. Asiat. Soc. Bengal 66: 213, 489. 1897 (incl. var. *puberula* and var. *latifolia*); Bourd., For. Trees. Trav. 129. 1908; Rama Rao, Fl. Pl. Trav. 142. 1914; Gamble, Fl. Presid. Madras 1: 409. 1919; Krishnam., J. Ind. bot. Soc 10: 159. 1932; Krishnam., Min. For. Prod. India 513-514. 1993.

### Local name(s)

Asokam.

### Description

**Trees**, 6-12 m high with dense crown; **branchlets** stout, short with crowded leaves. **Leaves** alternate, abruptly paripinnate, upto 30 cm long with rhachis often ending in a subulate appendage; **leaflets** petiolulate, uppermost often the largest, 3-22 x 1-8 cm, oblong or lanceolate, coriaceous, glabrous, cuneate, rounded or rarely subcordate at base, acute or shortly acuminate at apex; **petioles** upto 0.5 cm long, eglandular at base. **Flowers** orange-red in dense, terminal, upto 15 cm long corymbs, bract and bracteole; **calyx** petaloid, tubular, 4-lobed, upto 1.5 cm long with ovate or obovate, rounded lobes; **corolla** absent; **stamens** 6-8, with filaments upto 0.2 cm long and anthers yellowish upto 0.2 cm long; **pistil** upto 2.5 cm long, with stipe and ovary upto 0.4 cm long, style filiform, curved into a ring and minute, capitate stigma. **Pods** upto 18 x 4 cm, oval or oblong, flat, thick, rounded or cuneate at base, shortly beaked at apex, thickened along the margins; **seeds** 4-8, 3.5 cm long, ellipsoid-oblong (Fig. 38).



Fig. 38. *Saraca asoca* (Roxb.) Wilde

### Ecology

Graceful, evergreen trees with thick crown, rather rare in semi-evergreen and moist deciduous forests, especially growing along the sides of hill streams. It is also often planted in gardens, along road sides and in avenues. The tree flowers during January to March and fruits ripen by May-June.

## Distribution

### Kerala

Cannanore, Wynad, Calicut, Palghat, Trichur, Ernakulam, Idukki, Kottayam, Pathanamthitta, Quilon and Trivandrum districts; almost throughout the State, mainly from the mid to the highlands (Map 126).

### World

India, Sri Lanka, Bangladesh, Myanmar; grown in India, Malesia and elsewhere.

### Notes

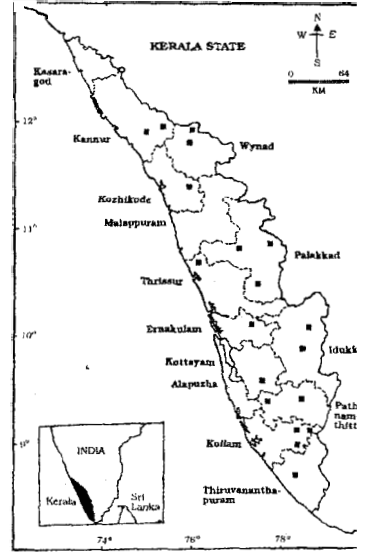
According to Blatter and Millard (1937), for Hindus, *Saraca asoca* is a sacred tree which they worship on every 27th of December. Among the Burmese, the tree is held sacred because they consider that it was under this tree that Gautama Buddha was born.

This species was till recently designated as *Saraca indicn* L. the type of which from Java was found different from materials belonging to the plant distributed in the Indian subcontinent. The *Saraca asoca* plant which is typified by a specimen of Roxburgh from Bengal is confined to India, Myanmar and Sri Lanka as its natural habitat, even though it is grown in Malesia. Moreover, *Saraca indica* L. is not found in India and it is confined to Malesia in its distribution.

Krishnamoorthy (1932) had reported the presence of two ovaries per flower, which is considered as a teratological variation, rather common in legumes. Typically, all legumes possess single ovary in each flower.

### Products and uses

The bark, leaves and flowers of the tree are medicinal. The bark, which contains several active principles, is curative for diseases like biliousness, dyspepsia, dysentery, piles, ulcers, etc. and is also a blood purifier. Flowers are used in the treatment of urinary disorders and diabetics. In Assam (India), the fruits are also used as a substitute for arecanuts. Narayana Iyer and Kolammal (1960) had elucidated the pharmacognosy of the species and its medicinal properties.



Map 126. Distribution of *Saraca asoca* (Roxb.) Wild in Kerala.

## Regeneration

This moisture and shade loving tree regenerates naturally by coppice shoots and from seeds. However, in Kerala, its natural regeneration is noted to be very poor and pods with seeds are mostly pest-infected by the time they become ripe to disperse viable seeds. Still, several seedlings are often seen growing below the mother trees in shaded conditions which later perish due to draught or other adverse factors affecting their survival.

For artificial regeneration of the tree, ripened seeds can be collected by June-July and seeds will remain viable only for about 2 months. Being large in size, about 97 seeds weigh one kilogram. When fresh, the germination percentage of healthy and unaffected seeds is almost 100% (FRI, 1983) and the nursery raised seedlings grow about 25-30 cm high during the first year. Direct sowing of seeds is also done for the artificial regeneration of the species. Protection from sun, watering, control of pests eating away the root portion of the seedlings, removal of weeds, etc. are necessary for the better survival of out planted seedlings. Frost and draught conditions are also unfavorable for the growth of *S. asoca*, which is rather slow growing for initial one or two years.

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- Krishnamoorthy, C.S. 1932. A note on the occurrence of bicarpellary pistles in the flower of *Saraca indica*. *J. Indian bot. Soc.* 10: 159.
- Narayana Iyer, K. and M. Kolammal 1960. *Pharmacognosy of Ayurvedic Drugs.* Series I, No. 4. Dept. of Pharmacognosy, University of Kerala, Trivandrum.

## 127. SARCOSTEMMA ACIDUM (ROXB.) VOIGT (Asclepiadaceae)

### Nomenclature

- Sarcostemma acidum* (Roxb.) Voigt, Hort. Sub. Calc. 542. 1845; Krishnam., Min. For. Prod. India 447. 1993.
- Asclepias acida* Roxb., Fl. Indica 2: 31. 1832.
- Sarcostemma brevistigma* Wt. et Arn. in Wt., Contr. Ind. Bot. 59. 1834; Wt., Ic. Pl. Ind. Orient. t. 595. 1842; Hook.f. in Hook.f., Fl. Brit. India 4: 26. 1883; Rama Rao, Fl. Pl. Trav. 261. 1914; Gamble, Fl. Presid. Madras 2: 838. 1921.

### Local name(s)

Soma-latha, Soma.

## Description

Leafless, straggling undershrubs, 2-3.5 m high; **branches** green, jointed, glabrous, upto 0.5 cm in diameter. **Flowers** greenish-white, in terminal many-flowered umbels; **pedicels** upto 0.7 cm long, slender, pubescent; **calyx** 5 partite, glandular inside with lobes upto 0.2 cm long, overlapping to the right, ovate-oblong, membraneous along the margins, subacute at apex; **corolla** rotate or subcampanulate, 5-lobed with the lobes upto 0.4 cm long, ovate-oblong, subacute at apex; **corona** double, arising from the staminal column and almost covering the anthers; **stamens** in a short staminal column arising from the base of the corolla and anthers with inflexed, suberect appendages; **pistil** with 2 carpels, styles united into a disc and style apex shortly conical or oblong-fusiform. **Follicles** upto 12 x 0.6 cm, lanceolate, tapering at both ends, straight, diverging; **seeds** upto 0.4 cm long, ovate, flattened with upto 1.5 cm long coma.

## Ecology

Climbers or stragglers on bushes and other low supports in the dry deciduous forest tracts of Kerala, especially at Marayur and Chinnar in the Devikolam Taluk of Idukki District. Flowers and fruits are borne during the dry months of December to April.

## Distribution

Kerala

Dry deciduous forests of Marayur and Chinnar in Idukki District and parts of South Kerala (Map 127).

World

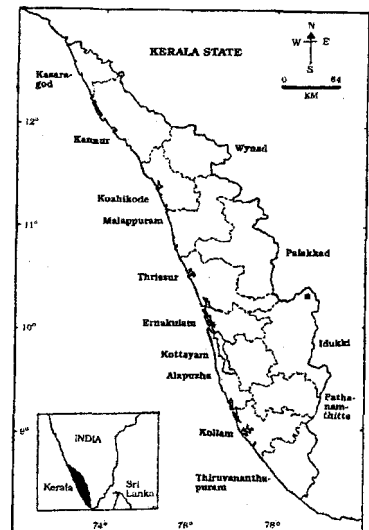
Peninsular India.

## Notes

*Sarcostemma brunonianum* Wt. et Arn., distributed in Peninsular India and Sri Lanka is an allied species, also collected as Soma-latha for medicinal use. Also, species like *Sarcostemma intermedium* Decne and *Sarcostemma stocksii* Hook.f. distributed in Peninsular India possess almost similar properties as that of *S. acidum* (Chopra, et al., 1956).

## Products and uses

The stem of the plant is often collected and dried for medicinal use as an emetic. Roots are also reported (Anonymous, 1972) to be an antidote for bite of rabid dogs. The active constituent of the plant is known to be toxic to



Map 127 Distribution of *Sarcostemma acidum* (Roxb) Voigt in Kerala

man, which acts as a repellent of white ants, especially in sugarcane fields (Krishnamurthy, 1993).

The waxy material contained in the stem-bark of the plant, collected as an exudate, on processing, yield a composite resin by treating with sulphur and formaldehyde (Anonymous, 1972). This resin is useful as a plasticizer for reclaimed rubber. The resin is also used in lacquer and varnish industries.

The plant is also important in religious contexts, even though it is noted (Anonymous, 1972) that this is not the species which produce Soma-latha of the Vedas.

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- Anonymous, 1972. *The Wealth of India: Raw Materials*. vol. 9. CSIR, New Delhi. p. 236.
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## 128. SARCOSTIGMA KLEINII Wt. ET ARN. ( Icacinaceae )

### Nomenclature

- Sarcostigma kleinii* Wt. et Arn., Edinb. New. Phil. J. 14: 299. 1833; Wt., Ic. Pl. Ind. Orient. t. 1854. 1852; Mast. in Hook.f., Fl. Brit. India 1: 594. 1875; Rama Rao, Fl. Pl. Trav. 80. 1914; Gamble, Fl. Presid. Madras 1: 199. 1915; Sleumer, Blumea 17: 254. 1969.
- Sarcostigma wallichii* Baill., Adansonia 10: 282. 1872; Mast. in Hook.f., Fl. Brit. India 1: 594. 1875.
- Sarcostigma edule* Kurz, J. Asiat. Soc. Bengal 17: 254. 1969.

### Local name(s)

Odal, Soma-valli, Soma-latha, Vella-odal.

### Description

Straggling or climbing **undershrubs** or **shrubs**, 3-5 m long; **branchlets** upto 1 cm across, terete, green, glabrous. **Leaves** simple, alternate, 8-25 x 4-10 cm, oblong, oblong-lanceolate or ovate, prominently reticulate veined on both sides, glabrous, acute, obtuse or rounded at base, acute or acuminate at apex; **petioles** 0.5-2 cm long, slender, glabrous. **Flowers** upto 0.3 cm long, orange-yellow, minute, in axillary or extra-axillary spicate racemes of

1-4 flowered fascicles; **calyx** cupular, 4-5 triangular-teethed, pubescent externally; **corolla** with 4-5 petals, each upto 0.3 cm long, oblong, acute, reflexed; **stamens** 4 or 5, almost 0.2 cm long; pistil (rudimentary in male flowers). with oblong or ovoid ovary, pubescent and 1-loculed with large, subsessile, conical stigma in female flowers. Drupes orange-red, 2-3.5 cm long, oblong, rugose externally (Fig. 39).



Fig. 39. *Sarcostigma kleinii* Wt et Am.

### Ecology

Climbers or stragglers with thick stem and prominently reticulated leaves, rather rare in the evergreen and semi-evergreen forests, often along hedges and other low supports in the openings. Flowers by November-December and fruits mature during February to May.

### Distribution

#### Kerala

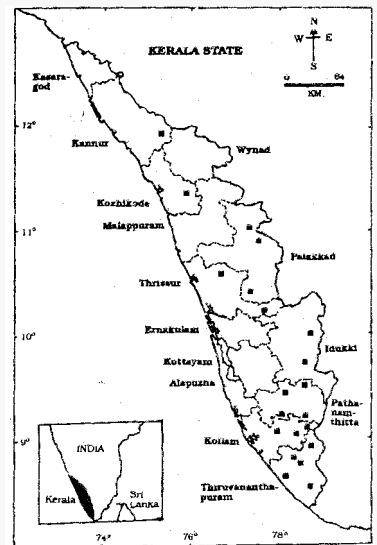
Cannanore, Calicut, Palghat, Trichur, Idukki, Pathanamthitta, Quilon and Trivandrum districts; almost throughout the State, mainly from the mid to the highlands (Map 128).

#### World

India, Indo-China, Java, Malay Peninsula.

### Products and uses

Seeds and bark of the stem are the products extracted from this plant, mainly for medicinal purposes. Powdered bark mixed with honey is curative for rheumatism, leprosy, hysterics and ulcers. Seeds also yield a fatty, edible oil used as illuminant and in medicinal preparations. Fruits are edible and medicinal



Map 128 Distribution of *Sarcostigma kleinii* wt et Am in Kerala

for rheumatism (Anonymous, 1972), and seed-meal is highly proteinaceous (about 40%) and edible.

### Production and marketing

About 85 kg of the dried seeds of the plant was received by the Kerala State SC & ST Federation (1998) during 1994-95 to 1996-97. The cost of the item was around Rs. 4.00 when the Federation sold out the product.

### References cited

- Anonymous, 1972. *The Wealth of India: Raw Materials*. vol. 9. CSIR, New Delhi. p. 236.
- Kerala State SC & ST Federation 1998. Different items of LFPP handled during 1994-95 to 1996-97 and price, fixed by MFP Committee per kilogram for 1997-98. Trivandrum (unpublished).

## 129. SCHIZOSTACHYUM BEDDOMEI (FISCH.) MAJUM. ( Bambusaceae )

### Nomenclature

*Schizostachyum beddomei* (Fisch.) Majum. in Karth. et al., Fl. India: Enum. Monocot. 281. 1989; Tew., Monogr. Bamb. 130. 1992.

*Teinostachyum beddomei* Fisch. in Gamble, Fl. Presid. Madras 3: 1860. 1934; Varm. et Bah., Indian For. Rec. (n.s.) Bot. 6(1): 4. 1980.

*Teinostachyum wightii* Bedd., Fl. Sylvat. South. India 322. 1873; Gamble, Ann. Roy. bot. Gardn. Calcutta 7: 99, pl. 87. 1896 & in Hook. f., Fl. Brit. India 7: 410. 1897; Bourd., For. Trees Trav. 402. 1908; Rama Rao, Fl. Pl. Trav. 448. 1914.

### Local name(s)

Cheru-mula, Chittu, Nanyura.

### Description

Arborescent bamboos, 5-20 m high with pendulous young branches; upto 3.5 cm diameter, brownish-yellow, ringed at nodes with internodes upto 40 cm long; **culm-sheaths** upto 25 x 8 cm, thin narrowed above and truncate at apex, not auricled, appressed brown-black hairy, truncate at apex; **ligules** almost 0.2 cm in length, entire. **Leaves** 15-25 x 2.5-4.5 cm, oblong-lanceolate, glabrous above, whitish hairy beneath, scabrous along the margins, unequal at the base, acuminate at apex, ending in a twisted point; **petioles** upto 1 cm long, attached to the rounded or attenuated base of the lamina. **Flowers** (spikelets) upto 2.5 cm long in large terminal drooping panicles of spiciform branchlets bearing mostly fertile spikelets; **glumes** 2-3 fertile, 1 terminal incomplete; palea shorter than the glumes, 2 keeled, ciliate on the keels, blunt or emarginate at apex; **stamens** exerted with slender filaments

and obtuse anthers; **pistil** with dipressed, globose, smooth stipulate ovary, style included in the beak of the perigynium and ending in 2 short plumose stigma. **Caryopsis** ovoid, glabrous stalked and beaked.

### Ecology

A very rare bamboo forming an undergrowth in the hills of southern Kerala at medium and high elevations, especially along stream-sides in the evergreen forests. It has been reported (Tewari, 1992) that the species flowers at long intervals and the culms perish after the fruits ripen. In Kerala, Rama Rao (1914) has reported the flowering month of this species as November.

### Distribution

Kerala

Trichur, Idukki and Trivandrum districts; confined to the highlands (Map 129).

World

Southern Peninsular India in the hills of Kerala and Tamil Nadu.

### Notes

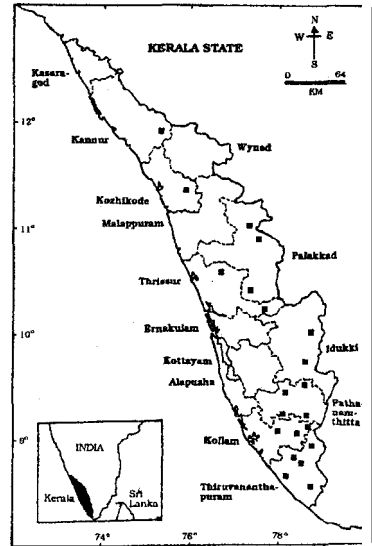
This useful bamboo, confined to South India in distribution, has not been mentioned in Krishnamurthy's (1993) enumeration of useful bamboo species of India.

### Products and uses

Mature culms of the bamboo are extracted for making mats, baskets and for fencing. The bamboo is also used in construction works.

### References cited

- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi.
- Rao, M. Rama 1914. *Flowering Plants of Travancore*. Govt. Press, Trivandrum. 448.
- Tewari, D.N. 1992. A *Monograph on Bamboo*. International Book Distributors, Dehra Dun. p. 130.



Map 129. Distribution of *Schizostachyum beddomei* (Fisch.) Majum. in Kerala.



**130. SCHLEICHERA OLEOSA (LOUR.) OKEN**  
(Sapindaceae)

**Nomenclature**

*Schleichera oleosa* (Lour.) Oken, Allg. Naturgesch. 3(2): 1341. 1841; Merr., J. Arn. Arbor. 31:284.195'0; Mukh., J. Eco. Tax. Bot. 1: 81.1980; Krishnam., Min. For. Prod. India 16,90,228,288,306,428,482,519,521-522.1993.

*Pistacia oleosa* Lour., Fl. Cochinch. 2: 615. 1790.

*Schleichera trijuga* Willd., Sp. Pl. 4(2): 1906. 1805; Wt. et Arn., Prodr. 114. 1834; Bedd., Fl. Sylvat. South. India t. 119. 1871; Hiern in Hook. f., Fl. Brit. India 1: 681. 1875; Bourd., For. Trees Trav. 96. 1908; Rama Rao, Fl. Pl. Trav. 94.1914; Gamble, Fl. Presid. Madras 1:248.1918; Radlk. in Engl., Pflanzenr. 98: 874.1956.

**Local name(s)**

Puvam.

**Description**

**Trees**, 20-30 m high; **bark** grey, smooth: **branchlets** twiggy, rigid. **Leaves** paripinnate, 4-8 foliate; **leaflets** increasing in size from lowest to the terminal pair, lowest pair upto 4-7.5 x 2-5.5 cm, terminal pair 8-20 x 3.5-9.5 cm, all pairs opposite or nearly so, entire, glabrous, rounded or tapering at base, obtuse or acuminate at apex; **petiolules** short, stout, articulated with the rachis. **Flowers** yellowish, polygamo-dioecious, fascicled on terminal and axillary racemes towards the apex of branchlets; **calyx** 5-lobed, each lobe triangular, acute at apex; **corolla** absent; **stamens** 5-8, with pubescent filaments inserted on the disc and oblong anthers; **pistil** with 3-4 loculed ovary attenuated into a rigid, slender, terete style, with 2-3 lobed stigma. **Capsules** upto 2 cm long, subglobose or ovoid, bluntly prickled, indehiscent; **seeds** 1-2 in each capsule, enclosed in pulpy aril.

**Ecology**

Lofty trees in the deciduous forests, with reddish foliage when fresh leaves appear. Flowers during February-March and fruits ripen during April-May.

**Distribution**

Kerala

Cannanore, Wynad, Calicut, Malappuram, Palghat, Trichur, Ernakulam, Idukki, Kottayam, Pathanamthitta, Quilon and Trivandrum districts; almost throughout the State, mostly from the mid to the highlands (Map 130).

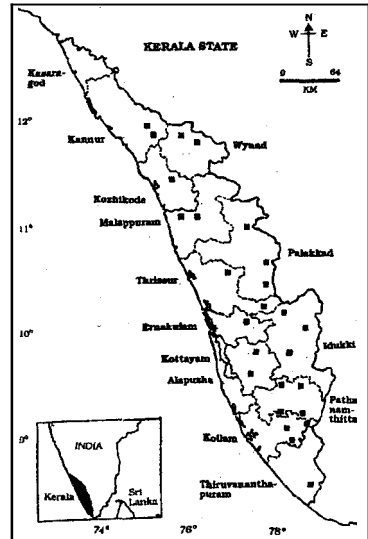
World

India, Sri Lanka, Myanmar, Java.

### Products and uses

The main non-timber product extracted from the tree is the seed oil used in industry and also in medicine. The fat content of the seed is about 36 percent. Seed oil called Macassar oil is mainly used as lamp oil, in glycerine and soap industry and as a textile lubricant. Often, it goes into adulteration of mustard oil also. Oil cake is an excellent manure and also used as fuel. Both the oil and oil cake possess insecticidal properties. The powdered seeds are often applied to ulcers of animals (Krishnamurthy, 1993) to remove maggots.

The bark of the tree which contains 9.4% tannin is used for external application against itches and an infusion of it is often curative for malaria. Raw fruits, pulp of ripe fruits, seeds and tender shoots are edible and young shoots are used as fodder, often in combination with wheat-straw and rape-cake. The tree is also a preferred host of Kusumi Lac. Krishnamurthy (1993) has also reported that the wood is used in the manufacture of paper.



Map 130 Distribution of *Schleicheria oleosa* (Lour) Oken in Kerala

### Production and marketing

It is mainly the flowers of the tree which are collected and marketed through the Kerala State SC & ST Federation (1988) as a non-wood forest produce, even though the seed-oil is the economically more important item produced by the plant. The Federation received about 325 kg of the flowers through its various collection centres in the State during 1996-97 at a cost of Rs. 12.35 per kg which was sold out at the rate of Rs. 13.00 per kilogram.

### Regeneration

The tree is frost and draught hardy and is also shade tolerant, especially during the initial stages of its growth. It regenerates well both from seeds and root suckers, and coppices and pollards in natural conditions. Seeds which get soon covered by soil after dispersal germinate and develop, and in the case of root suckers, soil working around mother trees promote shoot production.

Fruits of *S. oleosa* ripen by July-August and seeds collected during this

period can be stored in gunny bags or air-tight tins for about 1 or 2 years without losing much viability. Without any pre-treatment, about 30% of the seeds germinate. One kilogram of seeds contain about 1500-2200 numbers which can produce around 350 plants on germination (Dent, 1948). It takes only about 10 days after sowing for the germination and one year old, nursery raised plants are suitable for planting as stump, whose performance is reported (Kadambi and Dabral, 1955) to be better than seed sowing or entire transplanting of seedlings. Root cuttings are also reported to give about (FRI, 1981) 80% sprouting. Growth of seedlings varies from slow to moderate and within 10-15 years, the seedlings attain a height of about 4-5 m and 10-15 cm girth. When the tree is grown for the cultivation of lac, pruning and other silvicultural management inputs are necessary along with protection from pests and diseases.

### References cited

- Dent, T.V. 1948. The storage of seeds of Indian forest plants. *Indian Forest Records - New Series 7(1) Silviculture*. Manager of Publications, New Delhi.
- FRI, 1981. *Troup's Silviculture of Indian Trees*. vol. 3. Controller of Publications, Delhi. pp. 242-247.
- Kadambi, K. and S.N. Dabral 1955. Studies on the suitability of different methods of artificially regenerating forest species. *Indian For.* 81: 129-151.
- Kerala State SC & ST Federation 1998. Different items of LFPP handled during 1994-95 to 1996-97 and price fixed by MFP Committee per kilogram for 1997-98. Trivandrum (unpublished).
- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi. pp. 306, 428, 482.

## 131. SEMECARPUS ANACARDIUM L. F. (Anacardiaceae)

### Nomenclature

*Semecarpus anacardium* L.f., Suppl. Pl. 182. 1781; Wt. et Arn., Prodr. 168. 1834; Wt., Ic. Pl. Ind. Orient. t. 558. 1840-43; Bedd., Fl. Sylvat. South. India t. 166. 1871; Hook.f. in Hook.f., Fl. Brit. India 2: 30. 1876; Bourd., For. Trees Trav. 105. 1908; Rama Rao, Fl. Pl. Trav. 100. 1914; Gamble, Fl. Presid. Madras 1:226. 1918; Krishnam., Min. For. Prod. India 228-229, 284, 306, 334, 360. 1993.

### Local

Cherin-kuru, Cheru, Sambiri, Thembra-kay, Thenkotta.

### Description

Stunted **trees** or **shrubs**, 3-6 m high; **branches** horizontal or drooping with an

irritating juice. **Leaves** simple, spirally arranged, 12-50x8-30 cm, ovate-oblong, coriaceous, glabrous above, ashy-grey and pubescent beneath, cartilaginous along the margins, rounded, cuneate or cordate at base, rounded at apex; **petioles** 1-3 cm long, stout, pubescent. **Flowers** greenish or yellowish white, fascicled on pubescent panicles, shorter than the leaves; **pedicels** inconspicuous; **bracts** lanceolate, pilose; **calyx** 5-6 partite, with segments very short and pilose outside; **corolla** with 5-6, imbricate petals, upto 0.5 x 0.2 cm, ovate; **stamens** 5-6, basally inserted around the disc, imperfect in female flowers; **pistil** with subglobose, densely pilose ovary, produced into 3 stylar apices. **Drupes** upto 2.5 cm long, oblong or obliquely ovoid, smooth, black when ripe, with fleshy receptacle attached at the base; **seeds** pendulous with coriaceous testa.

### Ecology

Trees, rather rare in the moist deciduous forests, especially along roadsides and in disturbed and open forest patches. In the past, the trees were also rather common in the sacred groves of the midlands of Kerala. Flowers during June to September and fruits ripen by November-December.

### Distribution

#### Kerala

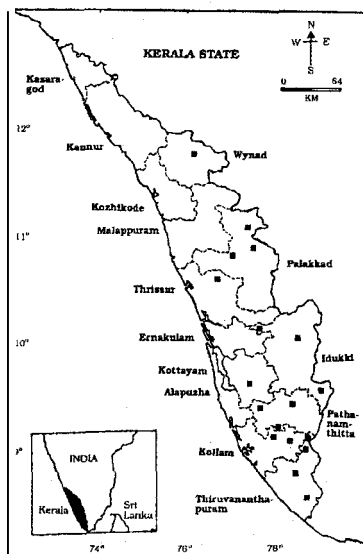
Wynad, Palghat, Trichur, Idukki, Kottayam, Pathanamthitta, Quilon and Trivandrum districts; almost throughout the State, mainly in the hilly uplands and highlands (Map 131).

#### World

India, North Australia.

### Products and uses

This is the marking nut tree or oriental cashew tree, whose pericarp-juice, fruits and seeds are extracted for marking and dyeing cloth and for the manufacture of varnish, paint, lacquers, enamels, moulding compositions and water-proofing and insulation materials (Krishnamurthy, 1993). The pericarp juice with rich phenol content, known as the Bhilawan-shell-liquid, enters into the making of a variety of surface coating compositions and for water-proofing textile fabrics. Also, in plastic, rubber, detergent, insecticide, herbicide and adhesive industries, it is used. The kernel of seeds which are edible, also yield oil useful as wood preserva-



Map 131. Distribution of *Semecarpus anacardium* L.f. in Kerala.

tive. Medicinally, the gum, juice of root bark, fruits (especially juice of pericarp) and seeds are used and Balakrishnan (1975) has reported the use of seeds in the treatment of cancer, especially of mouth and oesophagus. Seed oil is also curative of leucoderma, epilepsy, rheumatism, and so on. Krishnamurthy (1993) had reported that the kernel of the seed, which tastes like almond, is roasted and eaten as such or used in sweet-meats. The kernels also yield an oil of very pleasant taste.

### **Production and marketing**

The non-wood produce collected from this forest tree is the fruits. The Kerala State SC & ST Federation (1998) has not recorded the quantity of the produce that they handled during 1994-95 to 1996-97, even though the rate of procurement of the item was fixed as Rs. 9.50 per kg and selling price as Rs. 10.00 per kilogram.

### **Regeneration**

This moderate-shade bearing tree coppices readily and is reported to be highly resistant to fire, but sensitive to frost, with the capacity to recover when normal conditions are regained. Natural regeneration from seeds is also fair, provided the trees are not felled for the collection of seeds useful as the non-wood produce.

For artificial regeneration of the tree, seeds can be directly sown in forest areas during November to February. About 500-800 seeds weigh one kilogram and 21-57% of them germinate and the plant percent is about 52 (Sengupta, 1937). Nursery raised and transplanted seedlings are reported to perform poor. Within 10 years, the trees attain an average height of about 3 m and 12 cm of girth (FRI, 1981).

### **References cited**

- Balakrishnan, V.V. 1975. *Plants and Their Medicinal Properties*. Cherry Books, Madras.
- FRI, 1981. *Troup's Silviculture of Indian Trees*. vol. 3. Controller of Publications, Delhi. pp. 266-268.
- Kerala State SC & ST Federation 1998. Different items of LFPP handled during 1994-95 to 1996-97 and price fixed by MFP Committee per kilogram for 1997-98. Trivandrum (unpublished).
- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi. pp. 288-360.
- Sengupta, J.N. 1937. Seed weights, plant percent, etc. for forest plants in India. *Indian Forest Records- New Series 2(5) Silviculture*. Manager of Publications, New

**132. SHOREA ROXBURGHII G. DON**  
(Dipterocarpaceae)

**Nomenclature**

*Shorea roxburghii* G. Don, Gen. Hist. 1: 813. 1831; Janardh. in Sharma et Sanjapp. (ed.), Fl. India 3: 239-41. fig. 63. 1993.

*Shorea talura* Roxb. ex DC., Prodr. 2: 620. 1824 & Roxb., Fl. Indica 2: 618. 1832; Wt., Ic. Pl. Ind. Orient. t. 164. 1839; Thiselt. et Dyer in Hook. f., Fl. Brit. India 1: 304. 1874; Rama Rao, Fl. Pl. Trav. 35. 1914; Gamble, H. Presid. Madras 1: 83. 1915; Krishnam., Min. For. Prod. India 522. 1993.

*Vatica laccifera* Wt. et Arn., Prodr. 84. 1834.

*Shorea laccifera* (Wt. et Arn.) Heyne ex Wall. in DC., Prodr. 16(2): 630. 1868.

**Local name(s)**

Thaluram.

**Description**

Deciduous **trees**, upto 25 m high and 3 m in girth; **bark** light grey, smooth or narrowly fissured; **branchlets** dark-coloured, glabrous. **Leaves** simple, alternate, upto 21 x 8 cm, elliptic or elliptic-oblong, undulate, glabrous above, tomentose to glabrescent beneath, rounded or subcordate at base, acute, obtuse or rarely emarginate at apex; **petioles** 1-3.5 cm long, swollen in the distal half. **Flowers** white or pale pink in dense, terminal or lateral, drooping, lax panicles; **calyx** upto 0.4 cm long, tubular, glabrescent, whitish, with deltoid lobes, ciliate along margins and acute at apex; **corolla** upto 1 cm long, oblong-lanceolate; **stamens** 15 in 3 whorls with short filaments and ovate anthers with about 0.2 cm long, curved appendage; **pistil** with globose or ovoid, hairy ovary, style longer than the ovary and capitate stigma. **Fruits** upto 2.5 x 1.5 cm, ovoid, glabrous, tapering into the slender remnant part of the style with 3 calyx lobes upto 1.1 cm long, spatulate, saccate and parallel veined.

**Ecology**

An elegant tree mostly confined to moist deciduous forests, often planted in degraded sites, as it can survive in unfavourable conditions also. The leaves are shed by February-March and flowers are borne during that period. Fruits ripen and get wind dispersed during April-May.

**Distribution**

Kerala

Calicut, Ernakulam and Idukki districts, in the mid and highlands (Map 132).

World

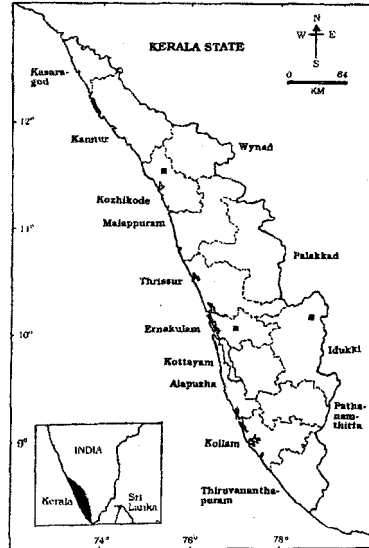
India, Myanmar, Indo-China, Thailand.

## Notes

Rama Rao (1914) recorded this species from Marayur near Munnar in Idukki District and FAO (1985) report mentions the occurrence of the tree at Muvattupuzha in Ernakulam District and in Calicut District of the State. In the various herbaria consulted, the species is not represented from Kerala and therefore the details given are based on specimens from Anamalai in Tamil Nadu State, bordering Kerala and also literature.

## Products and uses

Apart from the timber used in construction, the tree is also well known as the South Indian Lac Tree hosting the lac insect, *Laccifer lacca* Kern. An essential oil is also reported (FAO, 1985) to be present in the flowers of the plant and bark of it contains a resin (Anonymous, 1972).



Map 132 Distribution of *Shorea roxburghii* G. Don in Kerala.

## Regeneration

*S. roxburghii* is a light demander which comes up well in areas of high rainfall. The trees regenerate naturally by coppice shoots and seeds, especially in areas with ample soil moisture. About 1021 seeds weigh one kilogram and 64% germination and 55 plant percent has been reported for the species (FRI, 1980). Seed viability is very poor and artificial regeneration by direct sowing of seeds has been successfully tried in South India in which 60-70% survival of seedlings had been recorded (FRI, 1980). Raking of soil below seed-bearing trees and opening of canopy for the development of seedlings dispersed naturally, are also methods to promote the regeneration of the species in natural conditions.

## References cited

- Anonymous, 1972. *The Wealth of India: Raw Materials*. vol. 9. CSIR, New Delhi. pp. 321-322.
- FAO, 1985. *Dipterocarps of South Asia*. FAO Regional Office, Bangkok. pp. 215-218.
- FRI, 1980. *Troup's Silviculture of Indian Trees*. vol. 2. Controller of Publications, Delhi. pp. 328-332.
- Rao, M. Rama 1914. *Flowering Plants of Travancore*. Govt. Press, Trivandrum. p. 35.

**133. SIDA ACUTA BURM. F.**  
(Malvaceae)

**Nomenclature**

*Sida acuta* Burm.f., Fl. Ind. 147.1768 & Fl. Ind. 3: 171.1832, *emend* K. Schum., Fl. Brasil. 12,3: 326.1891; Wt., Ic. Pl. Ind. Orient. t. 95.1838; Dunn in Gamble, Fl. Presid. Madras 1:89. 1915; Paul in Sharma *et* Sanjapp. (ed.), Fl. India 3: 281, fig. 76.1993; Krishnam., Min. For. **Prod.** India 393. 1993.

*Sida lanceolata* Retz., Obs. 4: 119. 1786.

*Sida carpinifolia* auct. non L.f. (1785); Mast. in Hook.f., Fl. Brit. India 1:323. 1874; RamaRao, Fl. Pl. Trav. 37.1914.

**Local name(s)**

Cheru-paruva.

**Description**

Erect or ascending **herbs** or **undershrubs**, upto 1.5 m high; **branches** pubescent when young with minute stellate hairs, ultimately glabrescent. **Leaves** simple, alternate, 1.5-7 x 0.5-2.5 cm, lanceolate to linear, elliptic-lanceolate or ovate-oblong, coarsely or remotely serrate, hairy on both sides or glabrescent, obtuse or rounded and 3-nerved at base, acute at apex; **petioles** 0.2-0.5 cm long, pubescent; **stipules** upto 1 x 0.2 cm, lanceolate, linear or filiform. **Flowers** light yellow, solitary or in clusters of 2-8, axillary; **calyx** upto 0.5 cm across, campanulate, 5-fid with lobes upto 0.5 cm long, triangular and acuminate; **corolla** of 5 rotate petals, adnate to the staminal column at base, obliquely obovate and often emarginate at apex; **stamens** 5, in a column of about 0.4 cm long, glandular hairy and antheriferous towards apex; **pistil** with ovoid or globose ovary about 0.1 cm across with styles as many as the carpels and capitate stigma. **Mericarps** 6-10, upto 0.4 cm long, almost tetrahedral, awned, 1-seeded (Fig. 40).



Fig. 40. *Sida acuta* L.

**Ecology**

Rather common in openings, plantations, path sides and wastelands in moist and dry deciduous forest areas and also in non-forest areas, mainly in the midlands of Kerala. Flowers during September to December and fruits mature during November to May.



**Distribution**

Kerala

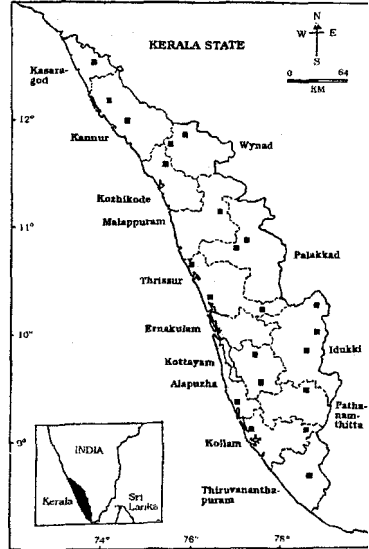
Kasaragod, Cannanore, Wynad, Calicut, Malappuram, Palghat, Trichur, Idukki, Kottayam, Alleppy, Pathanamthitta, Quilon and Trivandrum districts; throughout the State (Map 133).

World

Pantropic.

**Products and uses**

Tender stems and leaves are medicinal used in the treatment of rheumatism and also chewed for promoting the secretion of saliva. The leaves also possess demulcent and diuretic properties and are of therapeutic value. The leaves smeared with gingily oil are also curative for ulcers. The leaf juice is anti-inflammatory; used in the treatment of elephantiasis (Anonymous, 1972). A decoction of roots and leaves also cures haemorrhoids and impotency and also reduces chest pain. It is also used as an anthelmintic. The roots as such are diaphoretic, antipyretic, stomachic and astringent.



Map 133. Distribution of *Sida acta* L. in Kerala.

The yellowish, soft and durable stem-fibre is used for making ropes and twines (Krishnamurthy, 1993). The fibre is extracted after retting about 10 days in water (Anonymous, 1972). The stem is also used for making baskets, mats, brooms, and such other knitted items.

**References cited**

Anonymous, 1972. *The Wealth of India: Raw Materials*. vol. 9. CSIR, New Delhi. pp. 322-323.  
 Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi. p. 393.

**134. SIDA CORDATA (BURM. F.) BROSS.  
 (Malvaceae)**

**Nomenclature**

*Sida cordata* (Burm.f.) Bross., Blumea 14: 182.1966; Paul in Sharma *et* Sanjapp. (ed.) Fl. India 3: 283-285. fig. 77.1993.

*Melochia cordata* Burm.f., Fl. Ind. 143. 1768.

*Sida veronicifolia* Lamk., Encycl. Meth. Bot. 1: 5. 1753; Dunn in Gamble, Fl. Presid. Madras 1: 89. 1915; Krishnam., Min. For. Prod. India 229, 393. 1993.

*Sida humilis* Cav., Diss. 5. t. 134, fig. 2. 1788; Mast. in Hook. f., Fl. Brit. India 1: 322. 1874, excl. var. *veronicifolia*; Rama Rao, Fl. Pl. Trav. 37. 1914.

*Sida beddomei* Jacob, J. Bombay nat. Hist. Soc. 47: 50. 1950.

### Local name(s)

Valli-kurunthotti.

### Description

Prostrate or ascending **herbs**, upto 50-80 cm high; **branches** pubescent with scattered, long, simple or minute stellate hairs. **Leaves** simple, alternate, 0.5-0.7 x 0.3-0.5 cm, ovate or orbicular, crenate-dentate or serrate, hairy on both the surfaces, cordate at base, acute to acuminate at apex; **petioles** upto 2.5 cm long, pubescent; **stipules** upto 0.3 cm long, linear, filiform, hairy. **Flowers** light yellow or yellow, solitary or in few-flowered axillary racemes; **calyx** upto 0.3 cm across, campanulate, 5-fid, with lobes upto 0.5 cm long, deltoid or triangular and acuminate; **corolla** of 5, rotate petals, obovate and ciliate at base; **stamens** 5 in a staminal column of about 0.3 cm long, conical at base and antheriferous at apex; **pistil** with 5 carpels and 5 styles ending in capitate stigma. **Mericarps** 5, upto 0.4 x 0.2 cm, tetrahedral with rounded angles, awnless, slightly longitudinally keeled on the back, 1-seeded.

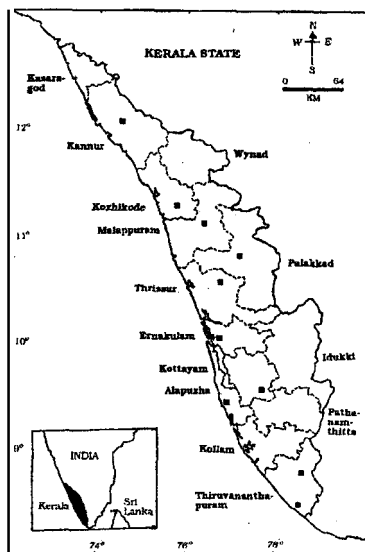
### Ecology

Fairly common in moist deciduous and semi-evergreen forests, especially in openings, plantations and disturbed fringes. Flowers and fruits mainly during September to November or almost throughout the year depending upon the habitat conditions.

### Distribution

Kerala

Cannanore, Calicut, Malappuram, Palghat, Trichur, Ernakulam, Kottayam, Alleppy and Trivandrum districts; almost throughout the State, mostly in the low and midlands (Map 134).



Map 134. Distribution of *Sida cordata* (Burm.f.) Bross. in Kerala

World

Pantropical.

### Products and uses

Leaves, flowers, fruits and roots of the plant are medicinal (Paul, 1993). The plant is considered to possess cooling, astringent and tonic properties and is used to cure fever and urinary disorders. The root bark is also used in the treatment of venereal diseases and flowers and fruits are used in the treatment of burning sensation in cases of micturition (Anonymous, 1972).

The stems of the plant yield a quality fibre. Krishnamurthy (1993) had reported that the leaves are also used as vegetable.

### References cited

- Anonymous, 1972. *The Wealth of India Raw Materials* vol 9 CSIR, New Delhi pp 325-326
- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi. p. 229.
- Paul, T.K. 1993. Family *Malvaceae*. In: B.D. Sharma and M. Sanjappa (ed.) *Flora of India*. vol. 3. Botanical Survey of India, Calcutta. p. 285.

## 135. SIDA CORDIFOLIA L. (Malvaceae)

### Nomenclature

***Sida cordifolia*** L., Sp. Pl. 684. 1753; Mast. in Hook.f., Fl. Brit. India 1: 324. 1874; RamaRao, Fl. Pl. Trav. 38. 1914; Dunn in Gamble, Fl. Presid. Madras 1: 89. 1915; Paul in Sharma *et* Sanjappa. (ed.) Fl. India 3: 285. 1993; Krishnam., Min. For. Prod. India 90. 1993.

### Local name(s)

Katturan, Vella-kurunthotti, Velluppan, Velluran.

### Description

**Undershrubs**, upto 80 cm high; **branches** tomentose or pubescent with an unpleasant smell. **Leaves** simple, alternate 2-5 x 0.5-4.5 cm, ovate to oblong or orbicular, crenate-serrate, stellate hairy on both surfaces, shallowly cordate and 5-7 nerved at base, obtuse, acute or rarely rounded at apex; **petioles** 0.3-0.5 cm long, pubescent; **stipules** upto 0.8 cm long, filiform, stellate-hairy. **Flowers** yellow or whitish-yellow, solitary or in axillary clusters of 2-5; **calyx** upto 0.7 cm across, campanulate, somewhat accrescent with triangular, acuminate lobes; **corolla** upto 1.2 cm across with 5 obliquely obo-

vate petals, ciliate at base and truncate at apex; **stamens** in a staminal column, upto 0.2 cm long, antheriferous at apex; **pistil** with stellate hairy conical ovary, styles as many as the carpels and capitate stigma. **Mericarps** 8-10, upto 0.3 cm long, 2-awned, retrorse-hairy, 1-seeded.

### Ecology

Common along pathsides, forest openings, plantations and waste places, especially in moist and dry deciduous forest areas. The plant is also rather common in homesteads, along roadsides and in waste places of the midlands of the State. Flowers and fruits almost throughout the year.

### Distribution

#### Kerala

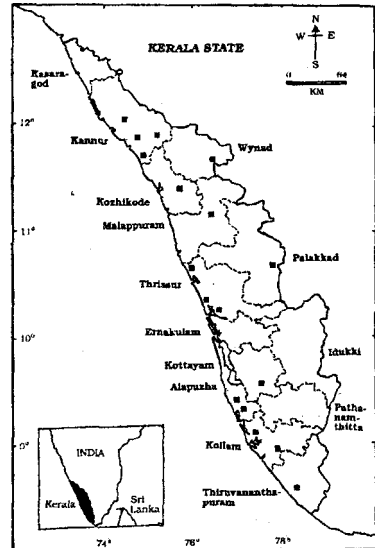
Cannanore, Wynad, Calicut, Malappuram, Palghat, Trichur, Kottayam, Alleppy, Quilon and Trivandrum districts; almost throughout the State, but rare in the highlands (Map 135).

#### World

Pantropical.

### Products and uses

The alkaloid Ephedrine, used extensively in cough preparations, is available in small quantities in this plant (Krishnamurthy, 1993). The roots, leaves and seeds are also medicinal. An infusion of roots is often given for urinary and bile disorders, venereal diseases and also against cystitis, strangury and haematuria (Anonymous, 1972). The leaves are reported to possess diuretic and emollient properties and are used to cure ailments like fever, dysentery, etc. The plant juice is also used in the treatment of elephantiasis (Anonymous, 1972). The seeds are also medicinal, having demulcent and laxative properties.



Map 135. Distribution of *Sida cordifolia* L. in Kerala.

### References cited

- Anonymous, 1972. *The Wealth of India: Raw Materials*. vol. 9. CSIR, New Delhi. pp. 323-324.
- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi. p. 30.

**136. SIDA RHOMBIFOLIA L.**  
(Malvaceae)

**Nomenclature**

*Sida rhombifolia* L., Sp. Pl. 684. 1753, emend Mast. in Hook. f., Fl. Brit. India I: 323. 1874; Rama Rao, Fl. Pl. Trav. 38. 1914; Dunn in Gamble, Fl. Presid. Madras 1: 90. 1915; Paul in Sharma *et* Sanjapp. (ed.) Fl. India 3: 289. fig. 79. 1993 (all in part); Siv. *et* Prad., Sida 16(1): 71-73, fig. 2. 1994.

*Sida rhombifolia* ssp. *rhombifolia* Bross., Blumea 14: 193. 1966.

*Sida rhombifolia* ssp. *rhombifolia* var. *rhombifolia* in Paul *et* Nayar in Nayar, *et al.* (ed.) Fasc. Fl. India 19: 214. 1988.

**Local name(s)**

Kurumthotti.

**Description**

**Herbs** or **undershrubs** with spreading branches upto 60 cm long; **branches** woody, minute-hairy or glabrescent. **Leaves** simple, alternate, 4.5-6 x 1.5-2.5 cm, ovate, oblong or rhomboid, crenate or serrate towards apex or entire, minutely pubescent, acute or obtuse at base, acute at apex; **petioles** yellow or pale orange, solitary or in clusters of 3-5, axillary; **calyx** upto 0.2 cm across, campanulate, lobed above the middle into 5, triangular or ovate, acuminate segments; **corolla** with 5 petals, cuneate at base and emarginate at apex; **stamens** 5 in a staminal column, hairy or glabrous, antheriferous at apex; **pistil** with upto 9 or 12 carpels, conical ovary, free styles and capitate stigma. **Mericarps** 6-12, 2-awned, stellate-hairy or glabrous, 1-seeded.

**Ecology**

Rather common in openings, plantations and fringes of moist and dry deciduous forests and also along roadsides, homesteads and waste places in the non-forested midlands of Kerala. Flowers during August to December and fruits mature during November to January.

**Distribution**

Kerala

Cannanore, Wynad, Calicut, Malappuram, Palghat, Trichur, Ernakulam, Idukki, Kottayam, Pathanamthitta, Quilon and Trivandrum districts; almost throughout the State (Map 136).

World

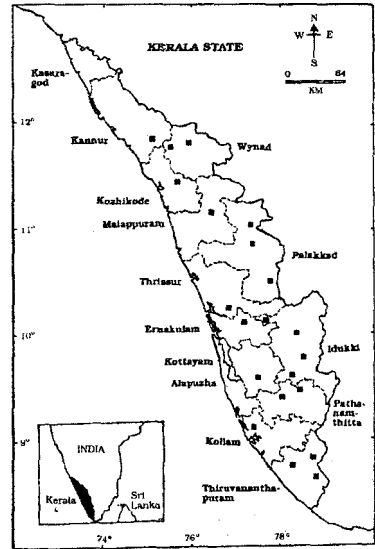
Pantropical.

**Notes**

This species, much extracted from the forests as a medicinal plant, has not

been included by Krishnamurthy (1993) in his account on non-timber forest products of India.

Paul (1993) had maintained the two subspecies, viz. ssp. *retusa* (L.) Bross. and ssp. *rhomboidea* and two varieties under the latter subspecies, namely var. *rhomboidea* and var. *scabrifolia* (Wt. et Arn.) Mast. Recently, Sivarajan and Pradeep (1994) who worked on the taxonomy of *Sida rhombifolia* complex in India, have segregated different infraspecific taxa belonging to the complex species *S. rhombifolia* into different species under the names *Sida alnifolia* L., *Sida rhombifolia* L., *Sida rhomboidea* Roxb. ex Flem. and *Sida scabrifolia* Wt. et Arn., with a key to identify each of them. Irrespective of their taxonomic status all such taxa are indiscriminately extracted for the products mentioned above.



Map 136. Distribution of *Sida rhombifolia* L. in Kerala.

### Products and uses

The plant is medicinal and also yields fibre. Medicinally, it is used in the treatment of tuberculosis and rheumatism. The mucilage of the stem has demulcent and emollient properties and is used in the treatment of skin diseases and as a diuretic and febrifuge. Roots are also used in the treatment of rheumatism and leucorrhoea (Anonymous, 1972). The stem-fibre of *S. rhombifolia* is comparable to jute in its qualities. The fibre is extracted by retting the stem after drying (Anonymous, 1972).

### Production and marketing

The medicinal roots of the plant is extracted on a very large scale from the State, both from forest areas and also adjoining non-forest lands. Also, the product is sold to medicinal plant raw-material shops, hill-produce shops, and so on, and a part of it is also marketed through the Kerala State SC & ST Federation (1998). The Federation handled more than 104960kg of the drug roots during 1994-95 to 1996-97, at a procurement cost of Rs. 9.50 and selling rate of Rs. 10.00 per kilogram.

**References cited**

- Anonymous, 1972. *The Wealth of India: Raw Materials*. vol. 9. CSIR, New Delhi. pp. 324-325.
- Kerala State SC & ST Federation 1998. Different items of LFPP handled during 1994-95 to 1996-97 and price fixed by MFP Committee per kilogram for 1997-98. Trivandrum (unpublished).
- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi.
- Paul, T.K. 1993. Family *Malvaceae*. In: B.D. Sharma and M. Sanjappa (ed.) *Flora of India*. vol. 3. Botanical Survey of India, Calcutta. p. 287.
- Sivarajan, V.V. and A.K. Pradeep 1994. Taxonomy of the *Sida rhombifolia* (Malvaceae) complex in India. *Sida* 16: 63-78.

**137. SIDA SPINOSA L.**  
(**Malvaceae**)

**Nomenclature**

*Sida spinosa* L., Sp. Pl. 683. 1753; Mast. in Hook.f., Fl. Brit. India I: 323. 1874; Rama Rao, Fl. Pl. Trav. 37. 1914; Dunn in Gamble, Fl. Presid. Madras I: 89. 1915; Paul in Sharma *et* Sanjapp. (ed.) Fl. India 3: 292. fig. 80, C-E., 1993.

**Local name(s)**

Mayirnanikkam.

**Description**

Erect or diffuse **herbs** or **undershrubs**, upto 60 cm high; **branches** minutely stellate-hairy. **Leaves** simple, alternate, 0.5-2.5 x 0.3-2 cm, ovate to oblong or rarely orbicular, serrate, 3-5 nerved and acute or rounded at base, acute or obtuse at apex; **petioles** upto 2 cm long, stellate-hairy; **stipules** upto 0.2 cm long, filiform, hairy. **Flowers** yellow or light yellow, solitary or in clusters of 3-5, axillary; **calyx** upto 0.4 cm across, campanulate, 5-triangular lobed, hairy; **corolla** of 5 petals, slightly united with the staminal column at base; **stamens** in a staminal column, antheriferous at apex; **pistil** with subtriangular ovary, styles as many as the carpels and capitate stigma. **Mericarps** 5, upto 0.2 cm long, trigonous with 2 divergent awns, 1-seeded.

**Ecology**

Common in forest plantations and openings of moist and dry deciduous forests of Kerala and also in waste places elsewhere in the midlands of the State. Flowers and fruits during March to December.

**Distribution**

Kerala

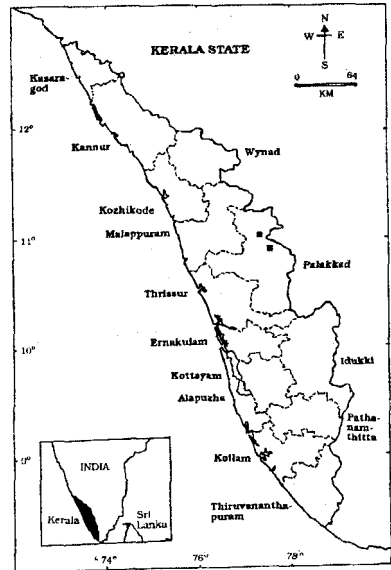
Palghat district, in the highlands (Map 137).

World

Pantropical.

**Products and uses**

Young stem, leaves, fruits and roots are medicinal. The leaves possess demulcent and refrigerent properties (Anonymous, 1972) and are used in the treatment of veneral diseases, gleet and against urinary complaints. The fruits also possess astringent and cooling properties and the roots are considered tonic and diaphoretic.



Map 137. Distribution of *Sida spinosa* L. in Kerala

**Reference cited**

Anonymous, 1972. *The Wealth of India: Raw Materials* vol. 9. CSIR, New Delhi. p. 325.

**138. SOLANUM VIOLACEUM ORTEGA.**  
(Solanaceae)

**Nomenclature**

*Solanum violaceum* Ortega., Nov. Pl. Deser. 56. 1798; Nicol. et al., Intrap. Hort. Malab. 252. 1988.

*Solanum anguivi* sensu Mathew et Rani in Mathew, Fl. Tamilnadu Carn. 3(1): 1058. 1983 (non Lamk., Tabl. Encycl. 2: 23. 1794).

*Solanum indicum* sensu auctt. (non L., 1753); Wt., Ic Pl. Ind. Orient. t. 346. 1840; Hook. f. in Hook. f., Fl. Brit. India 4: 234. 1883; Rama Rao, Fl. Pl. Trav. 284. 1914; Gamble, Fl. Presid. Madras 2: 938. 1923; Krishnam., Min. For. Prod. India 230. 1993.

**Local name(s)**

Cheru-chunda, Puthiri-chunda.

**Description**

**Undershubs**, upto 1 m high, much branched and prickly; **prickles** yellow, upto 1 cm long, flattened towards base. **Leaves** simple, alternate, 4.5-10.5 x 2-7.5 cm, shallow-lobed, ovate-oblong, somewhat oblique, prickly along the



nerves, villous above, stellately fulvous-wooly beneath, subequal at base; **petioles** upto 5.5 cm long, hairy, prickly. **Flowers** purplish blue in extra-axillary, stellate-hairy, racemose cymes with needle like hairs; **pedicels** 1-2cm long, hairy; **calyx** campanulate with 5 triangular lobes, upto 0.5 cm long, lobes triangular-ovate; **corolla** densely woolly externally with 5 lobes, upto 2 cm long, oblong, acute; **stamens** 5 with short filaments and anthers upto 0.8 cm long, linear-oblong; **pistil** with hirsute, upto 2.5 cm long ovary, pubescent style upto 1 cm long and acute stigma. **Berries** yellow, upto 1 cm long, subglobose, with the calyx lobes persistent; **seeds** 0.2-0.3 cm across, almost circular, thin, smooth (Fig. 41).



Fig 41 *Solanum violaceum* Orteg

**Ecology**

Common in shade, especially in moist deciduous and semi-evergreen forests. Flowers during Septemberto May and fruits ripen mostly by October-November.

**Distribution**

Kerala

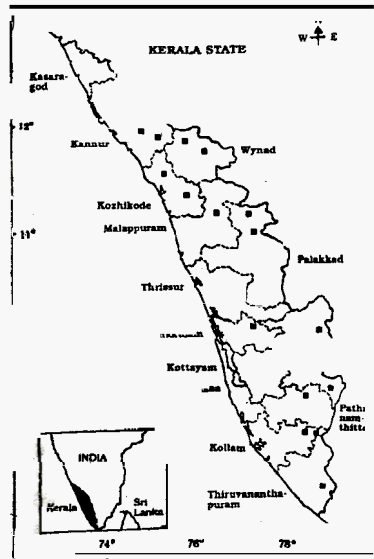
Cannanore, Wynad, Calicut, Malappuram, Palghat, Ernakulam, Idukki, Pathanamthitta, Quilon and Trivandrum districts; almost throughout the State, mainly from the mid to the highlands (Map 138).

World

Asia, Malaya, China, Philippines

**Productsand uses**

Roots, fruits and seeds of the plant are highly medicinal and hence extracted on a large scale. Roots are remedial for several ailments and is also one of the ingredients of Dasamoola (ten roots), a much reputed drug combination in the Ayurvedic system of medicine. Fruits of this plant are both medicinal and



Map 138 Distribution of *Solanum violaceum* Ortege in Kerala

also used in the preparation of curries, chutneys and preserves. It contains the glyco-alkaloid Solasonine and is also an alternate source of the steroids used in the preparation of cortisone and steroid sex hormones. Seeds, which contain a pale yellow semi-drying oil, are used in the treatment of tooth ache.

### Notes

Hawkes (1978) had pointed out that the plant commonly named in Indian Floras as *S. indicum* is not the real *S. indicum* plant described by Linnaeus. Therefore, the name *S. indicum* was rejected as *nomen ambiguum*. Moreover, Hawkes (1978) had also pointed out that *S. indicum* L. is synonymous with *S. ferox* L. which is common in South-East Asia.

*Cheru-chunda* or *Puthiri-chunda* in Malayalam is a species confined to Asia, which is different from *S. indicum*. In Indian Floras the inclusion of Asian species under the binomial *S. indicum* was done according to Burman (1768). Hepper (1978) had pointed out this mistake and lectotypified the name *S. indicum* L. and identified the species with *S. ferox* L (Hepper, 1978). Further, Hepper (1978) treated *S. anguivi* Lamk. as the correct name for the Asian plant known as *S. violaceum* Ort., as the former is an earlier validly published name for the species, if they are considered one and the same. However, Hepper (1978) had warned that 'the name *S. anguivi* should be used with caution, especially in India, pending further taxonomic clarification'. Therefore, the names *Solanum indicum* and *S. anguivi*, given as synonyms here, pertain only to the Indian material, for which *S. violaceum* is accepted as the correct name, following Hepper (1988). In future, if *Solanum anguivi* Lamk. is found identical with *S. violaceum* Ort., then, the species must be called by the former name.

Another closely allied species of *S. violaceum* is *S. incanum* L. and Maheswari (1966) described and illustrated the fruits of *S. incanum* similar to that of *S. violaceum*. The two species can be distinguished by the following characters (Sharma, 1994).

Leaves dark green, calyx not enlarging in fruit, berries 0.8-1 cm in diameter  
... *S. violaceum*.

Leaves yellowish green, calyx enlarging in fruit, berries 2-2.5 cm in diameter  
... *S. incanum*.

### Production and marketing

Large quantity of the medicinal roots of the plant is collected and marketed as a forest produce and a limited quantity of the item is also gathered from the non-forest areas of the State. From forest areas alone, the Kerala State SC & ST Federation (1988) received about 1,82,207 kg of the drug roots, which

they procured for Rs. 6.65 per kg and disposed off at the rate of Rs. 7.00 per kg, during 1994-95 to 1996-97. The fruits and seeds of the plant are also medicinal and there is no data available on the quantity of the items harvested or marketed.

### References cited

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- Hawkes, J.G. 1978. Systematic notes on the Solanaceae. *Bor. J. Linn. Soc. London* 76: 288-291.
- Hepper, F.N. 1978. Proposal to list *Solanum indicum* L. and *Solanum sodomum* L. as rejected names under Article 69 of the ICBN. *Taxon* 27: 555.
- Hepper, F.N. 1988. *Revised Handbook of the Flora of Ceylon*. vol. 6. New Delhi. p. 378.
- Kerala State SC & ST Federation 1998.. Different items of LFPP handled during 1994-95 to 1996-97 and price fixed by MFP Committee per kilogram for 1997-98. Trivandrum (unpublished).
- Maheswari, J.K. 1966. *Flora of Delhi*. CSIR, New Delhi, p. 245, fig. 151.
- Sharma, M. 1994. Taxonomic notes on North Indian plants. *J. Eco. Tax. Bot.* 18(2):387-394.

### 139. STERCULIA URENS ROXB. ( Sterculiaceae )

### Nomenclature

*Sterculia urens* Roxb., Pl. Corom. 1: 25. t. 24. 1795; Wt. *et* Arn., Prodr. 63. 1834; Hook.f.in Hook.f., Fl. Brit. India 1: 355. 1874; Bourd., For. Trees Trav. 44. 1908; Rama Rao, Fl. Pl. Trav. 46. 1914; Gamble, Fl. Presid. Madras 1: 106. 1918; Datta, Indian For. 92: 510-516. 1966; Chandra in Sharma *et* Sanjapp. (ed.) Fl. India 3: 470-471. 1993; Krishnam., Min. For. Prod. India 9, 16, 231, 242-243, 252-254, 257, 394, 482. 1993.

### Local name(s)

Kavalam, Thondi.

### Description

Deciduous **trees**, 8-15 m high; **bark** smooth, white, papery, flaking off; **branchlets** with conspicuous leaf scars, pubescent. **Leaves** simple, crowded at the apex of twigs, digitately 3-5 lobed, 11-25 cm across, velvety pubescent below, cordate at base, with lobes entire, glabrous or nearly so, caudate-acuminate at apex; **petioles** 8-9.5 cm long, terete, tomentose. **Flowers** yellow, 0.6-0.8 cm across, in glandular, pubescent, terminal panicles on deciduous twigs; **pedicels** almost 0.4 cm long, tomentose; **calyx** campanulate, upto 0.5

cm long, hairy with 5 oblong-lanceolate, spreading, acute lobes, hairy glandular at the base; **corolla** absent; **stamens** (in male flowers) united into a column, upto 0.3 cm long with terminal 10-15 free anthers; **pistil** with 5 globose carpels, ovary borne on a short gynandrophore with sterile anthers at base (in female flowers), upto 0.2 cm long style and radiating stigmas. **Follicles** 5, almost 4 x 1.5 cm, ovoid-oblong, densely pubescent with stiff, red, stinging bristles; **seeds** 3-6, black, almost 0.7 x 0.5 cm, oblong, glossy.

### Ecology

Large or medium sized trees, rare in the deciduous forest tracts at low and medium elevations, especially in open areas. Flowers during December-January and fruits are produced in April-May. Flowers appear on defoliated branchlets.

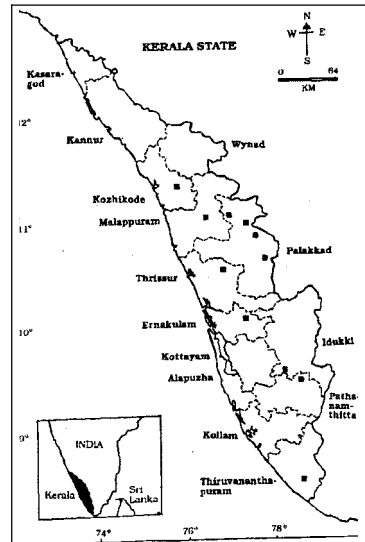
### Distribution

#### Kerala

Calicut, Malappuram, Palghat, Trichur, Ernakulam, Idukki, Pathanamthitta and Trivandrum districts; almost throughout the State, more commonly in the hilly uplands (Map 139).

#### World

India, Sri Lanka, Malesia.



Map 139. Distribution of *Sterculia urens* Roxb. in Kerala.

### Products and uses

Karaya gum is the main product extracted from this plant. On an average, a tree above 90 cm girth, yields 1-5kg of the gum in one season (April- June) of extraction. The gum is used as thickening agent, printing paste in textile industry, pulp binder in paper industry, and as ingredient in medicinal and cosmetic preparations. In leather industry, it forms an ingredient in dressing compositions. The gum is also used in the preparation of sweet meats and ice-creams and in the manufacture varnishes, inks, rubber compositions, linoleum, oil cloth, paper coating, polishes and in engraving (Krishnamurthy, 1993). The bark yields fibre used in cordage and cloth making. The seeds are edible and the edible seed oil is also used in soap industry. The wood has been reported to yield about 30% pulp with high cellulose content, used in the manufacture of rayon and paper. Datta (1966) had tabulated the details of distribution of the species in India and also given information on its various uses and Krishnamurthy (1993) had elaborated on different aspects of cultivation and gum production from this tree.

### Production and marketing

The gum of the tree is commercially known as Indian Tragacanth. While there is no record of its procurement by the Kerala State SC & ST Federation (1998) from the forest areas of Kerala, there are reports on the large scale production, domestic consumption and export of the item from India. As recorded by Shiva, *et al.* (1996), the export of the gum from the country during 1980-81 was 647 tonnes which was reduced to about 598 tonnes during 1990-91 and the income from the export of the item during 1990-91 was Rs. 42.3 million.

### Regeneration

*S. urens* is a strong light demander, which regenerates in dry, rocky, unshaded forest areas by coppicing and also from seeds. However, low fertility of seeds is one of the negative factors affecting the natural regeneration of the tree.

For artificial regeneration of the tree, seeds can be collected during April-May from natural forest areas. One kilogram of seeds contain about 4000-6000, numbers as reported for samples collected from different parts of India (FRI, 1981). Seeds cannot be stored for long and untreated seeds give better germination. Seeds germinate within 15 days after sowing and there are records of upto 88% germination (FRI, 1981) in the nursery trials. Plant percent is also quite high, ie. upto 90 percent. Seeds can be sown in leaf-cups, polythene tubes, nursery trays or nursery beds soon after collection with intermittent watering and shading is not essential. Entire transplanting of container seedlings in the field is the usual method, eventhough stump-planting is also practised (Kadambi and Dabral, 1955). Transplanted seedlings suffer from die back upto 22% (FRI, 1981) for 2-3 years until a stout shoot is produced. In general, 90-100% survival has been reported for the transplanted seedlings with an average height growth of 7-13 cm in a year.

### References cited

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- FRI, 1981. *Troup's Silviculture of Indian Trees*. vol. 3. Controller of Publications, Delhi. pp. 62-68.
- Kadambi, K. and S.N. Dabral 1955. Studies on the suitability of different methods of artificially regenerating forest trees. *Indian For.* 81: 129-151.
- Kerala State SC & ST Federation 1998. Different items of LFPP handled during 1994-95 to 1996-97 and price fixed by MFP Committee per kilogram for 1997-98. Trivandrum (unpublished).
- Knshnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi. pp. 252-257.

Shiva, M.P., S. Aswal, A. Sharma, P. Mathur and R. Chandra 1996. *Trends of Export and Import of the Minor Forest Products in India*. Centre for Minor Forest Products, Dehra Dun. 38 p.

**140. STERCULIA VILLOSA ROXB. EX DC.**  
(Sterculiaceae)

**Nomenclature**

*Sterculia villosa* Roxb. ex DC., Prodr. 1:483.1824; Wt. et Arn., Prodr. 63.1834; Mast. in Hook.f., Fl. Brit. India 1:355.1874; Bourd., For. Trees Trav. 45.1908; Rama Rao, Fl. Pl. Trav. 47. 1914; Gamble, Fl. Presid. Madras 1: 106. 1915; Datta, Indian For. 92: 510-516.1966; Chandra in Sharma et Sanjapp. (ed.) Fl. India 3: 472.1993; Krishnam., Min. For. Prod. India 9,233,265,394.1993.

**Local name(s)**

Ana-naru, Vakka.

**Description**

Deciduous **trees**, 8-14 m high; bark pale white; **branchlets** few, whorled, spreading, villous when young. **Leaves** simple, crowded at the apex of twigs, palmately 5-7 lobed, 20-40 cm across, glabrescent or stellate hairy above, velvety hairy below, cordate at base with lobes 15-30 cm long, oblong-lanceolate, acuminate at apex; **petioles** 10-30 cm long, pubescent, stouter towards apex; **stipules** upto 2 cm long, lanceolate, acuminate, cauducous. **Flowers** pinkish yellow in pubescent, drooping terminal panicles, upto 30 cm long, with male and female flowers inter-mixed; **calyx** pinkish inside, companulate, downy externally with 5, oblong-lanceolate, hairy, acute, spreading lobes; **corolla** absent; **stamens** (in male flowers) united into a column, upto 0.3 cm long, recurved with 10 anthers; **pistil** (in female flowers) with stellate hairy, 5 ovaries produced on stout, upto 0.3 cm long, cylindrical gynandrophore with stout, hairy, reflexed style, 5 lobed stigma and sterile anthers at base. **Follicles** 3-5, red, 2.5-3.5 x 1.5-3 cm, oblong, rusty-villous, spreading; **seeds** black, 3-5 in each follicle, 0.5-1 x 0.4-0.6 cm, oblong, smooth.

**Ecology**

Small or medium sized trees, common in the deciduous forest tracts, especially in rocky and grassy slopes and open areas. Flowering during January to March and fruiting in April-May. Completely deciduous and flowering trees during summer is noticeable from a distance in open forest areas.

## Distribution

### Kerala

Palghat, Trichur, Ernakulam, Idukki and Trivandrum districts; mainly in the hilly uplands and highlands (Map 140).

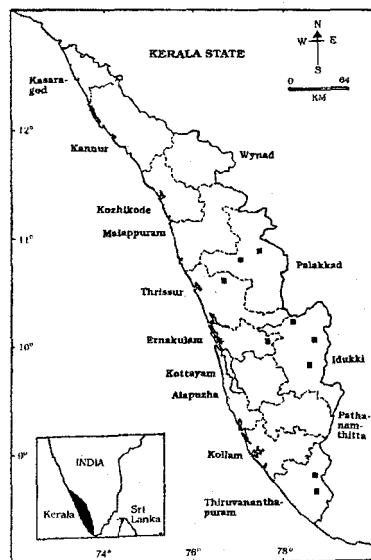
### World

India, Nepal, Bhutan, Bangladesh, Myanmar.

## Products and uses

It is mainly the bark-fibre which is extracted from this tree, apart from the poor quality of matchwood and softwood it produces. The hard fibre from the inner bark is very strong and is made into different types of ropes including the one used for dragging timber logs by elephants. The fibre is also made into bags.

Roasted or cooked seeds and also roots (Watt, 1893) are edible, and even though not commercially exploited, the whitish gum from the bark of the tree is useful in veterinary practices (Anonymous, 1976). The gum is also used like the Karaya gum for almost all purposes as noted by Krishnamurthy (1993). Datta (1966) has tabulated the different products extracted from this tree of Indo-Sri Lankan distribution and reported that it is also cultivated in Muzafarnagar, Uttar Pradesh, India.



Map 140. Distribution of *Sterculia villosa* Roxb ex DC. in Kerala.

## Regeneration

The tree is characteristic to the dry and rocky forest areas of the State. It regenerates well in natural conditions, either by coppicing or seed germination. In damp conditions, the seeds often rot and become non-viable. Also, seedlings grow fast in natural conditions and attain an average height of 4-6 m within 4-5 years (FRI, 1981).

For artificial regeneration of the species, seeds can be gathered from follicles, off the trees, and by sun-dried to remove the seeds. On storage, viability of seeds is often lost within a year. About 240-265 seeds weigh one kilogram. The seeds sown in nursery beds germinate 50-72% within about 20 days (FRI, 1981) and entire transplant of seedlings is recorded to be very successful (Kadambi and Dabral, 1955). Also, direct sowing of seeds or stump planting with a success of about 85% are other methods to regenerate the species.

(FRI, 1981). Height growth of the seedlings is about 4-6 m within a period of 4-5 years (FRI, 1981).

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- Knshnamuithy, T 1993 *Minor Forest Products of India* Oxford & IBH, New Delhi p 265
- Watt, George 1893. *A Dictionary of Economic Products of India*. vol. 6. Govt. of India Press, Calcutta. p. 365.

## 141. STEREOSPERMUM COLAIS (BUCH.-HAM. EX DILLW.) MABBER. (Bignoniaceae)

### Nomenclature

- Stereospermum colais* (Buch.-Ham. ex Dillw.) Mabber., *Taxon* 27: 553. 1978; Nicol. *et al.*, *Intrp. Hort. Malab.* 73. 1988.
- Bignoiaia colais* Buch.-Ham. ex Dillw., *Rev. Ref. Hort. Malab.* 28. 1839.
- Stereospermum personntunz* (Hassk.) Chatt., *Bull. bot. Soc. Bengal* 2(1): 70. 1948; Santisuk, *Kew Bull.* 28: 178. 1973.
- Bignonia chelonoides sensu* Roxb., *Fl. Indica* 3: 106. 1832 (pro parte, non L.f.).
- Stereospermum chelonoides sensu* DC., *Bibl. Univ. Genev.* 2, 17 (Revis. Bignon.) 8: 125. 1838 & DC., *Prodr.* 9: 210. 1845 (pro parte, quod descr.); Wt.,  *Ic. Pl. Ind. Orient. t.* 1341. 1848; Bedd., *Fl. Sylvat. South. India t.* 72. 1870; Clarke in Hook.f., *Fl. Brit. India* 4: 382. 1884; Bourd., *For. Trees Trav.* 243. 1908; Rama Rao, *Fl. Pl. Trav.* 297. 1914; Burk., *Rec. bot. Surv. India* 10: 331. 1925.
- Dipterosperma personatum* Hassk., *Flora* 25(2): Biech. 28. 1842.
- Stereospermum tetragonum* DC., *Prodr.* 9: 210. 1845; Gamble, *Fl. Presid. Madras* 2: 998. 1924.

### Local name(s)

Karing-kura, Pathiri, Pupathiri, Poopathiri.

### Description

**Deciduous trees**, 10-25 m high; **bark** greyish-yellow; branchlets spreading,



glabrous. **Leaves** compound, imparipinnate; **leaflets** 7-11, opposite, 3-11 x 2.5-5 cm, elliptic-oblong, glabrous, obtuse or oblique at base, caudate-acuminate at apex; **petiolules** upto 1 cm long or upto 3.5 cm long for terminal leaflet. **Flowers** pale yellow with reddish purple tinge, upto 3 cm long, in lax, drooping panicles; **pedicels** upto 0.4 cm long, slender, glabrous, articulated at base; **calyx** yellowish purple, companulate, 0.5-0.8 x 0.3-0.5 cm, 3 to 5 unequal obtuse, glabrous lobed; **corolla** 1.5-1.8 x 0.6-0.8 cm, bell-shaped, basal part narrow, terete, hairy inside the tube from the base to the central part, 5-lobed with the upper two lobes upto 0.8 cm long, partially fused laterally, lower 3 lobes 0.7-1 x 0.6-0.8 cm, with prominent ridges; **stamens** 4 in two pairs with glandular filaments, 0.6 and 0.8 cm long, and divaricate anthers almost 0.1 cm long; pistil with ovary upto 0.4 cm long, oblong-cylindric, style upto 1 cm long and stigma about 0.1 cm long. **Capsules** upto 50 x 1 cm, terete or tetragonous, glabrous, curved or spirally twisted, pointed, covered with white specks; **seeds** upto 0.4 cm across, winged, upto 0.6 cm long (Fig. 42).



Fig. 42. *Stereospermum colais* (Buch.-Ham. ex Dillw. Mabber

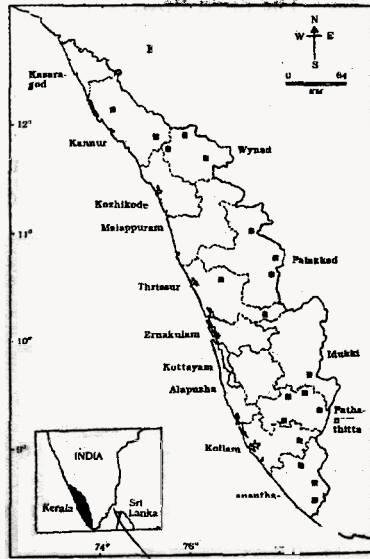
**Ecology**

Trees with almost straight, clean trunk, rather common in the deciduous forests and also in the outskirts and along forest pathsides, open areas, forest gaps, and so on. Flowers are borne during April to June and fruits ripen by November-December.

**Distribution**

Kerala

Cannanore, Wynad, Palghat, Trichur, Idukki, Pathanamthitta, Quilon and Trivandrum districts; almost throughout the State, mainly in the hilly uplands and highlands (Map 141).



Map 141 Distribution of *Stereospermum colais* (Buch-Ham ex Dillw.) Mabber in Kerala

**World**

India, China, Malaya, Singapore, Thailand, Cambodia, Vietnam, Laos.

**Notes**

This species of medicinal importance, common in the forests of Kerala has not been mentioned in the work of Krishnamurthy (1993).

**Products and uses**

Bark of the tree contains a crystalline bitter substance which has antibacterial and antitubercular properties (Chopra, *et al.* 1956). Ethanolic extract (50%) of the aerial parts of the tree is also reported to show antileukaemic activity in mice.

Decoction of root is useful against asthma, cough and excessive thirst. Root bark and the flowers mixed with sugar are used in the preparation of cooldrinks. Leaf juice, heated with oil, is used as a remedy for ear and tooth diseases and against rheumatism (Anonymous, 1976). Leaves and roots have antipyretic properties. Leaves are also used as fodder.

**Production and marketing**

The dried flowers of the plant is the non-wood produce in record, as procured and marketed by the tribal societies from the forest areas of the State. The flowers are also graded before marketing based on their quality, and in total, the Kerala State SC & ST Federation, during 1994-95 to 1996-97, handled about 17,897 kg of the item at a procurement cost of Rs. 70.00 and sold it for Rs. 80.00 per kilogram. Other medicinal parts of the plant are also important as non-wood produce on which there is no data available on extraction or marketing.

**Regeneration**

Natural regeneration of the species is by coppicing, root-suckers and also by germination of seeds. Being a draught and fire-hardy species, the survival of new recruits is also better.

The species can be artificially propagated from seeds and root suckers. Rarely, stem cuttings are also used for its regeneration, especially when plantings have to be done along boundaries (FRI, 1985). On an average, 9500 seeds weigh one kilogram and ripened seeds can be collected during November to January from fruits developed subsequent to the flowering which takes place in April, May and June. The seeds on storage will lose their viability within a year (Dent, 1948). Entire transplanting of nursery raised seedlings is the best method for the artificial regeneration of the species rather than seed-sowing and stump-planting (Kadambi and Dabral, 1955).

## References cited

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- Chopra, R.N., S.L. Nayar, and I.C. Chopra 1956. *Glossary of Indian Medicinal Plants*. CSIR, New Delhi. p. 234.
- Dent, T.V. 1948. The storage of seeds of Indian forest plants. *Indian Forest Records- New Series 7(1) Silviculture*. Manager of Publications, New Delhi.
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- Kadambi, K. and S.N. Dabral 1955. Studies on the suitability of different methods of artificially regenerating forest species. *Indian For.* 81: 129-151.
- Kerala State SC & ST Federation 1998. Different items of LFPP handled during 1994-95 to 1996-97 and price fixed by MFP Committee per kilogram for 1997-98. Trivandrum (unpublished).
- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi.

## 142. STRYCHNOS NUX-VOMICA L. ( Strychnaceae )

### Nomenclature

*Strychnos nux-vomica* L., Sp. Pl. 189.1753; Roxb., Pl. Corom. 7, t. 4.1795; Bedd., Fl. Sylvat. South. India t. 243. 1872; Clarke in Hook.f., Fl. Brit. India 4: 90: 1883; Bourd., For. Trees Trav. 237.1908; Rama Rao, Fl. Pl. Trav. 266.1914; A. W. Hill, Kew Bull. 1917: 183.1917; Gamble, Fl. Resid. Madras 2: 868.1923; Bisset, et al., Lloydia 36(2): 189. 1973; Nicol. et al., Intrap. Hort. Malab. 164. 1988; Krishnam..Min. For.Prod. India 8,16,92-93,98,410,441,447.1993.

### Local name(s)

Kanjiram, Mazhu-kanjiram.

### Description

Deciduous **trees**, 5-15 m high; **bark** yellowish grey, smooth or lenticellate; **branchlets** twiggy with swollen nodes, often subterete and spiny. **Leaves** simple, opposite, 6-14 x 3.5-10 cm, broadly ovate, coriaceous, glabrous, acute or rounded and 5-nerved at base, acuminate at apex; **petioles** almost 0.5 cm long, glabrous. **Flowers** dull or greenish white, in terminal and axillary cymose panicles; **peduncles** short, pubescent; **calyx** minute, 5-lobed,



Fig. 43. *Strychnos nux-vomica* L.

upto 0.2 cm long, pubescent externally; **corolla** tubular, 5-lobed, upto 1 cm long, hairy inside towards base; **stamens** 5 or rarely 4, inserted at the throat of the corolla tube with filiform filaments and ovate anther locules; **pistil** with glabrous, ovoid ovary, glabrous style and capitate stigma. **Berries** orange-red when ripe, 3-10 cm across, globose, rough but shiny with brittle pericarp; **seeds** 1-6, greyish-white, upto 2 cm across, discoid, slightly concave on one side and convex on the other, silky appressed hairy throughout (Fig. 43).

### Ecology

Stunted trees, rather common in moist deciduous and open forests, especially in the foothills, plains, river banks and disturbed areas. Flowers during February to April and fruits ripen during November to March.

### Distribution

#### Kerala

Cannanore, Wynad, Calicut, Malappuram, Palghat, Trichur, Ernakulam, Idukki, Pathanamthitta, Quilon and Trivandrum districts; almost throughout the State (Map 142).

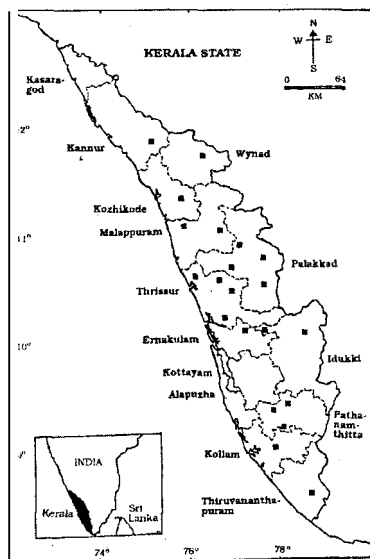
#### World

India, Sri Lanka, Myanmar, Siam, Indo-China, Malesia.

### Products and uses

As the source of the alkaloids Strychnine and Brucine, almost all parts of the plant are useful, and seeds are extensively exploited for extraction of the same. Strychnine is known as a powerful nerve stimulant and in the Indian system of medicine it is used as a tonic, stimulant and febrifuge and its

preparations are often prescribed for various nervous disorders. Strychnine also enters into the manufacture of several vermin killers, insecticides and animal poisons. Brucine, on the other hand, is mainly used as a denaturant of alcohol, used in cosmetic and perfume industries. Nux-vomica seeds are effective as animal poison and also insecticide. It is also remedial for narcotic poisons and chronic alcoholism. Bark, wood and leaves of the tree also possess medicinal properties and the timber is not attacked by white ants. Therefore, it is extensively used in the making of agricultural implements and tool handles. Krishnamurthy (1993) had elaborated aspects like propagation, collection and processing of seeds, medicinal uses and pharmacological preparations, storage, trade and adulterations of products with regard to this species.



Map 142 Distribution of *Strychnos nux-vomica* L. in Kerala

### Production and marketing

The dried seeds of the plant are collected and marketed as the non-wood produce, both from forest and non-forest areas of the State. However, the exact details on the total quantity of the item collected from the State is not available. Also, as the item is marketed through the the Kerala State SC & ST Federation (1998) and also other hill-produce marketing agencies, the price of the commodity also vary. In fact, the Kerala State SC & ST Federation marketed only about 21 kg of the item during 1996-97 at the rate of Rs. 6.00 per kilogram.

### Regeneration

The tree is shade-tolerant and draught hardy, but sensitive to frost. In natural conditions, it coppices well and roots-suckers are also often produced. Seeds dispersed from ripe fruits germinate, especially when fallen in moist humus or sandy soil. Fruits ripen during December to May.

While there is little information available on the artificial regeneration of the species, treatment of seeds with cold or hot water is reported (FRI, 1985) to increase germination percentage. Since the seeds germinate with difficulty, direct sowing for artificial regeneration of the species may not be suitable. To generate seedlings for planting, seeds are to be sown in the nursery after suitable treatments by March (FRI, 1985). Before sowing, the seeds have to be sun-dried after removal of the pulp. To get better germination percentage, underweight and broken seeds may be removed by hand-sorting or by floating method. Also, dried seeds can be stored for about a year (Dent, 1948). On an average, 600-800 seeds weigh one kilogram and germination percentage varies from 30-52%. It takes upto 120 days to complete germination and plant percent varies from 11-52 (FRI, 1985). From wood samples, the girth increment of the tree in a year is calculated to be around 2.2 cm (FRI, 1985).

### References cited

- Dent, T V 1948 The storage of seeds of Indian forest plants *Indian Forest Records -New Series 7(1) Silviculture* Manager of Publications, New Delhi
- FRJ, 1985. *Troup's Silviculture of Indian Trees*. vol. 6. Controller of Publications, Delhi. pp. 169-172.
- Kerala State SC & ST Federation 1998. Different items of LFPP handled during 1994-95 to 1996-97 and price fixed by MFP Committee per kilogram for 1997-98. Trivandrum (unpublished).
- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi. pp. 92-98.

**143. STRYCHNOS POTATORUM L.F.**  
(Strychnaceae)

**Nomenclature**

*Strychnos potatorum* L.f., Suppl. Pl. 148. 1781; Roxb., Pl. Corom. 1:9, t. 5. 1795; Wt., III. Ind. Bot. t. 156. 1850; Bedd., Fl. Sylvat. South. Indiat. 163. 1871; Clarke in Hook. f., Fl. Brit. India 4: 90. 1883; Bourd., For. Trees Trav. 270. 1908; Rama Rao, Fl. Pl. Trav. 266. 1914; A.W. Hill, Kew Bull. 1917: 154. 1917; Gamble, Fl. Presid. Madras 2: 868. 1923; Bisset *et al.*, Lloydia 36: 191. 1973; Krishnam., Min. For. Prod. India 93, 97-98, 5 15. 1993.

**Local name(s)**

Katakam, Terra, Terram-paral, Thettam-paral.

**Description**

Deciduous **trees**, 5-15 m high; **trunk** often fluted with dark, scaly, craked bark; **branchlets** thickened at nodes, glabrous. **Leaves** simple, opposite, subsessile, 5.5-10 x 2-5 cm, ovate, elliptic or ovate-lanceolate, coriaceous, glabrous, acute, rounded or obtuse and 3-5 nerved at base, acute at apex with conspicuous transverse nerves; **petioles** upto 0.2 cm long, glabrous. **Flowers** dull white, subsessile in short, axillary cymes produced on mature wood; **peduncles** upto 0.4 cm long, glabrous; **calyx** upto 0.3 cm long with 5, ovate, acute lobes; **corolla** tubular, upto 0.4 cm long with 5, ovate, acute lobes, hairy at base; **stamens**



Fig. 44. *Strychnos potatorum* Lf.

5 or rarely 4, inserted in the throat of the corolla tube with short, filiform filaments and ovate, parallel-loculed anthers; **pistil** with 2 or 1-loculed, ovoid, ovary, long, glabrous style and capitate or obscurely 2-lobed stigma. **Berries** brown or black, upto 2 cm across, subglobose with thick rind, pulpy inside; **seeds** pale yellow, almost 1 cm across, circular, compressed, appressed-silky-hairy (Fig. 44).

## Ecology

Fairly common in the dry deciduous forests, plains and foothills. This medium sized tree is quite characteristic to dry and rain-shadow regions of the State like Walayar, Chinnar and Marayur and Nagarcoil in Tamil Nadu. Flowers during February to April and fruits mature during November to March.

## Distribution

### Kerala

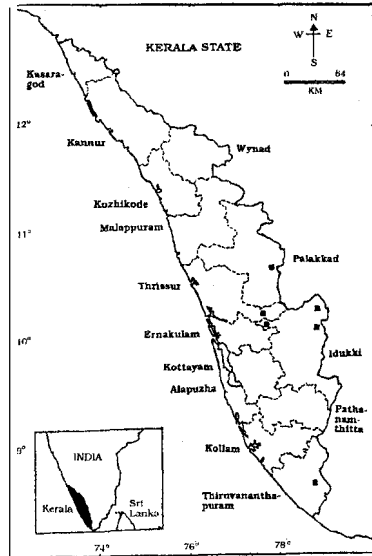
Palghat, Trichur, Idukki and Trivandrum districts; mainly in the highlands (Map 143).

### World

India, Sri Lanka, Myanmar, Africa.

## Products and uses

Seeds and roots of the tree are extracted for medicinal use and seeds are non-poisonous, used for clearing muddy water. This property of seeds is mainly due to the combined action of colloids and alkaloids present in it. Medicinally, seeds are reported to have tonic, stomachic, demulcent and emetic properties, used in the treatment of cough, bronchial troubles, eye diseases, etc. (Krishnamurthy, 1993). Roots are used in the treatment of skin diseases. Also, leaves serve as poultice over maggot affected ulcers. The fruit-pulp is edible as such or made into preserves in certain parts of India.



Map 143. Distribution of *Strychnos potatorum* L.f. in Kerala.

## Production and marketing

It is mainly the dried seeds of the tree which are gathered and marketed as the non-wood forest produce. The cost of the item is fixed as Rs. 4.75 per kg for procurement and Rs. 5.00 per kg for marketing by the Kerala State SC & ST Federation (1998) and during 1994-95 to 1996-97, the exact quantity of the produce that the Federation gathered and marketed is not in record.

## Regeneration

This moderate shade-bearer tree is also fairly draught resistant as it is habituated to mainly moist deciduous, dry deciduous and thoring forth of India. In natural conditions, the tree regenerates well by coppices, and root-suckers and from seeds.

For artificial regeneration of *S. potatorum* ripened fruits can be collected during November to March. Dried seeds separated from fruits weigh about 1660 numbers per kilogram (FRI, 1985). Nursery sown seeds record a germination percentage of about 14 and plant percent around 10 (FRI, 1985). Therefore, 1 kg of seeds on germination produce about 166 seedlings and germination period can be reduced by soaking the seeds in cold water for a day before sowing in the nursery beds.

**References cited**

FRI, 1985. *Troup's Silviculture of Indian Trees*. vol. 6. FRI & Colleges, Dehra Dun. pp. 172-173.

Kerala State SC & ST Federation 1998. Different items of LFPP handled during 1994-95 to 1996-97 and price fixed by MFP Committee per kilogram for 1997-98. Trivandrum (unpublished).

Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi. pp. 98-99.

**144. SYMPLOCOS COCHINCHINENSIS (LOUR.) MOORE SUBSP.  
LAURINA (RETZ.) NOOTB.  
(Symplocaceae)**

**Nomenclature**

*Symplocos cochinchinensis* (Lour.) Moore subsp. *laurina* (Retz.) Nootb., Leidew Bot. Ser. 1: 156. 1975; Nicol. *et al.*, Intrap. Hort. Malab. 255. 1988.

*Myrtus laurina* Retz., Obs. 4: 26. 1786 (*non S. laurina*) Wall. ex G. Don, Syst. 4: 3. 1837.

*Usteria racemosa* Dennst., Schluss. 14, 25, 31. 1818.

*Symplocos spicata* Roxb., Fl. Indica 2: 541. 1832; Bedd., Fl. Syvat. South. India 149. 1872; Clarke in Hook.f., Fl. Brit. India 3: 573. 1882; Bourd., For. Trees Trav. 227. 1908; Rama Rao, Fl. Pl. Trav. 243. 1914; Gamble, Fl. Presid. Madras 2: 782. 1923.

*Symplocos spicata* Roxb. var. *laurina* (Retz.) Clarke in Hook.f., Fl. Brit. India 3: 573. 1882.

**Local name(s)**

Kambli-vetti, Pachotti.

**Description**

**Shrubs** or small **trees**, 5-12 m high; **branchlets** glabrous, except the inflorescence. **Leaves** simple, alternate, 5-15 x 3-6 cm, elliptic, elliptic-lanceolate or obovate, coriaceous, crenate, serrate or almost entire, glabrous and chartaceous, acute or attenuate at base, acute or acuminate at apex; **petioles**



1-1.5cm long, bract and bracteole. **Flowers** white or yellowish-white, fragrant, sessile, in axillary, glabrous or pubescent branched spikes, upto 6 cm long; **calyx** with 5 sepals, each upto 0.1 cm long, shortly adnate to ovary at base, obtuse at apex; **corolla** with 5 petals, shortly tubular, with recurved lobes almost 0.3 cm long, rounded at apex; **stamens** numerous in 5 bundles with filaments upto 0.4 cm long and globular anthers; **pistil** with upto 0.1 broad, globose ovary, style upto 0.5 cm long and capitate stigma. **Drupes** upto 0.5 cm across, ampulliform, faintly ridged with an apical ring; **seeds** 2-3, oblong.

**Ecology**

Rather common in evergreen, shola and moist deciduous forests; also sometimes seen in sacred groves and undisturbed vegetation patches in the midlands of the State. The plant produces flowers and fruits during February to November.

**Distribution**

**Kerala**

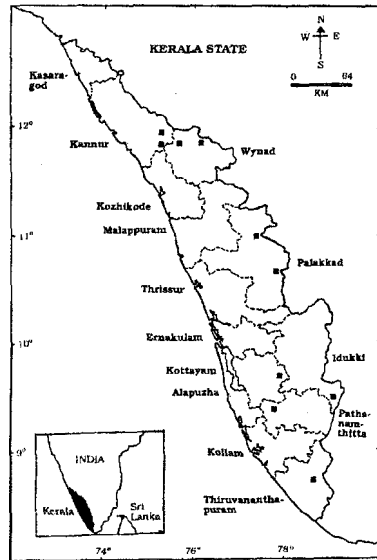
Cannanore, Wynad, Palghat, Idukki, Kottayam, Pathanamthitta and Trivandrum districts; almost throughout the State, mainly in the highlands (Map 144).

**World**

India, Sri Lanka, Myanmar, Thailand, Indio-China, China, Hainan, Formosa and Japan to Malesia.

**Notes**

The subsp. *laurina* is distinguished from the typical subsp. *cochinchinensis* by glabrous calyx lobes, often ciliate and not enlarged in fruits. The leaves of the plant turn yellow on drying. Krishnamurthy (1993) had not mentioned the species in his work on the non-timber forest produces of India.



Map 144. Distribution of *Symplocos cochinchinensis* (Low.) Moore ssp. *laurina* in Kerala.

**Products and uses**

The bark of the tree is extracted for the glycoside it contains, which on acid hydrolysis yields D-glucose and Pelargonidin, used medicinally. Powdered bark mixed with honey is also curative for biliousness, haemorrhages, diarrhoea and venereal diseases. The wood is reported to be useful (Anonymous,

1952) for making match splints. The leaves which impart yellow colour are used as a mordant in dyeing.

### Production and marketing

The bark of the tree is the non-wood produce extracted and marketed. The Kerala State SC & ST Federation (1998) handled about 37,040 kg of the drug item during 1994-95 to 1996-97 at a procurement price of Rs. 6.65 per kg and selling rate of Rs. 7.00 per kilogram.

### References cited

- Anonymous, 1952. Notes on the utilization and silviculture wood based industries of India. *Indian For.* 78:274.
- Kerala State SC & ST Federation 1998. Different items of LFPP handled during 1994-95 to 1996-97 and price fixed by MFP Committee per kilogram for 1997-98. Trivandrum (unpublished).
- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi.

## 145. SYZYGIUM CUMINI (L.) SKEELS (Myrtaceae)

### Nomenclature

- Syzygium cumini* (L.) Skeels, U.S. Dept. Agric. Bur. Pl. India Bull. 248: 25. 1912; Merr. et Perr., J. Arn. Arbor. 19: 108. 1938; Nicol. et al., Intrap. Hort. Malab. 194. 1988; Krishnam., Min. For. Prod. India 233,361,430. 1993.
- Myrtus cumini* L., Sp. Pl. 471. 1753.
- Eugenia jambolana Lamk., Encycl. Meth. Bot. 3: 198. 1789; Wt., Ic. Pl. Ind. Orient. t. 535. 1842; Bedd., Fl. Sylvat. South. India t. 199. 1972; Duthie in Hook. f., Fl. Brit. India 2: 499. 1879; Bourd., For. Trees Trav. 163. 1908; Rama Rao, Fl. Pl. Trav. 166. 1914.
- Syzygium jumbolanum* (Lamk.) DC., Prodr. 3: 259. 1828; Wt. et Arn., Prodr. 329. 1834; Gamble, Fl. Presid. Madras 1: 481. 1919.

### Local name(s)

Naga, Nanga, Njara, Njaval, Perun-naval.

### Description

**Trees**, 20-30 m high with spreading branches; **branchlets** slender, terete, creamy-white. **Leaves** simple, opposite, 4-10 x 2-4.5 cm, elliptic or ovate-lanceolate, thinly coriaceous, undulate along the margins, glabrous, obtuse or acute at base, long acuminate at apex; **petioles** 0.8-1.5 cm long, slender, reddish. **Flowers** greenish-white, fragrant, in terminal or axillary cymes; **calyx** obscurely 4-5 lobed, upto 0.5 cm long, goblet shaped, narrowed towards

base; **corolla** with petals upto 0.4 x 0.3 cm, elliptic, calyprate and fugaceous; **stamens** numerous, upto 0.4 cm long, white with slender filaments and small, versatile anthers; **pistil** with 2 (rarely 3) loculed ovary, filiform style and minute stigma. **Berries** dark purple, upto 1.5 x 1 cm, broadly ellipsoid, crowned by the truncate calyx rim, pulpy, 1-seeded; **seeds** 1 x 0.5 cm, ellipsoid.

### Ecology

Large, evergreen trees, common along river sides in evergreen, semi-evergreen and deciduous forests and also along road sides, forest outskirts and in gardens. Flowers during December to March and fruits ripen during January to August.

### Distribution

#### Kerala

Cannanore, Wynad, Calicut, Malappuram, Palghat, Trichur, Ernakulam, Idukki, Kottayam, Pathanamthitta, Quilon and Trivandrum districts; almost throughout the State, mainly from the mid to the highlands (Map 145).

#### World

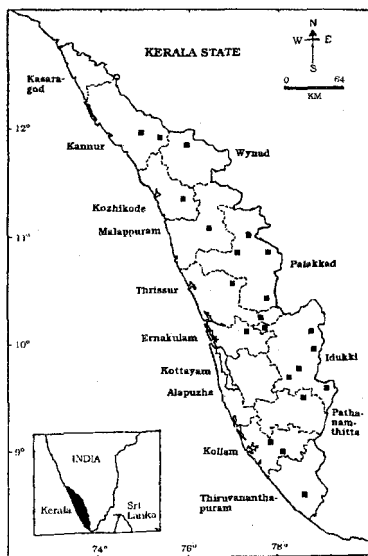
India, Sri Lanka, Malesia, South China, Pacific.

### Products and uses

Edible fruits rich in glucose and fructose are the major non-timber product collected from this tree which is consumed as such or prepared into jam, jelly, squash, vinegar, wine, liquors, etc. Bark is also sometimes extracted and used for dyeing, turning and colouring fish-nets, and as medicine (Krishnamurthy, 1993). Bark extract has also proved to possess antibiotic activities, so also leaf extracts. Leaves and seeds are cattlefeeds and the flowers form an important source of amber-coloured and delicious honey.

### Regeneration

The tree is a shade bearer when young and older trees can withstand frost conditions and average draught. But, when they grow in wet habitats, draught can affect them and young seedlings are often damaged by fire. In natural conditions, the tree coppices well and regenerates from seeds. Seeds which are mostly dispersed by birds germinate during the monsoon season and prevention of fire can improve the survival and growth of the seedlings.



Map 145. Distribution of *Syzygium cumini* (L.) Skeels in Kerala.

For artificial regeneration, ripened fruits containing seeds can be collected during June, July or August. Fruits may be collected from the ground, fallen on ripening. After removal of the pulp by washing, the seeds are to be sun-dried before sowing. On storage, the seeds lose their viability, and hence sowing has to be done immediately after collection. Depending on the area of collection in different parts of India, 1100-1800 seeds weigh one kilogram and germination and plant percentage may reach upto 96 (FRI, 1984). In the nursery, seeds can be sown, either broadcast or in drills, and watered and weeded regularly. The seedlings can be pricked and retained in polythene bags for about 2 years before they are transplanted by the onset of rainy season. Also, regeneration of the species by direct sowing of seeds and stump-planting have proved successful (FRI, 1984):

### References cited

- FRI, 1984. *Troup's Silviculture of Indian Trees*. vol. 5. Controller of Publications, Delhi. pp. 268-280.
- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi. p. 361.

## 146. TERMINALIA ARJUNA (ROXB EX DC.) WT. ET ARN. (Combretaceae)

### Nomenclature

- Terminalia arjuna* (Roxb. ex DC.) Wt. et Arn., Prodr. 314. 1834; Bedd., Fl. Sylvat. South. India t. 28. 1869; Hook. f. in Hook. f., Fl. Brit. India 2: 447. 1878; Bourd., For. Trees Trav. 157. 1908; Rama Rao, Fl. Pl. Trav. 162. 1914; Gamble, Fl. Presid. Madras 1: 465. 1919; Krishnam., Min. For. Prod. India 336, 362, 368-370, 483. 1993.
- Pentaptera arjuna* Roxb. ex DC., Prodr. 3: 14. 1828 & Roxb., Fl. Indica 2: 438. 1832.
- Terminalia berryi* Wt. et Arn., Prodr. 314. 1834.

### Local name(s)

Attu-maruthu, Kula-maruthu, Nir-maruthu, Vella-maruthu.

### Description

**Trees**, 15-30m high with greenish-white, thick, flaking-off and smooth bark; **branchlets** often horizontal or spreading. **Leaves** simple, alternate or subopposite, 7-14 x 3.5-6 cm, oblong or elliptic-oblong, dull green above, pale brownish beneath, shallowly crenate-serrate towards apex or entire,

rounded, subcordate or unequal sided at base, obtuse or subacute at apex; **petioles** 0.5-1 cm long, glandular towards apex, close to the base of the lamina. **Flowers** greenish-white, sessile, in short, axillary spikes or terminal panicles; **calyx** upto 0.4 cm long, ovoid or cylindric, constricted above the ovary, broadly companulate with triangular teeth; **corolla** absent; **stamens** 10, inserted on the calyx tube, biseriate, with the lower 5 opposite and upper 5 alternate to the calyx lobes, subulate or filiform filaments and exerted and small, didymous anthers; **pistil** with 1-loculed, glabrous ovary, subulate, often villous style base, simple stigma and the disc yellowish or reddish hairy. Drupes yellow, five angled, 2-5 cm long, ovoid or ovoid-oblong, glabrous, fibrous-woody 5-winged, one seeded (Fig. 45).



Fig. 45. *Terminalia arjuna* (Roxb ex DC.) Wt et Al

during January to May.

**Distribution**

Kerala

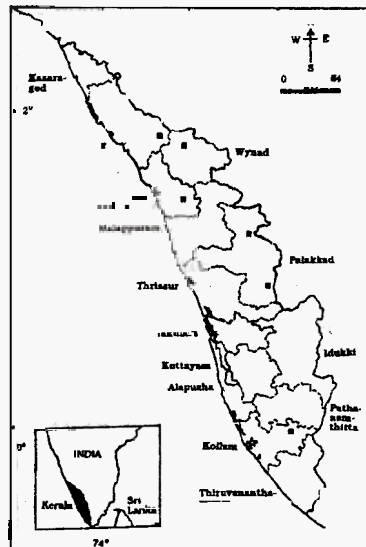
Cannanore, Wynad, Calicut, Palghat and Quilon districts; more common in the hilly uplands and highlands (Map 146).

World

India, Sri Lanka.

**Products and uses**

Apart from timber, bark and fruits are the parts mainly exploited from this tree, used in dyeing and tanning industry. Bark yields about 17% of tannin on zero moisture basis and 12% soluble non-tan, both used in tanning industry, industry (Krishnamurthy, 1993), imparting light brown colour for leather.



Map 146. Distribution of *Terminalia arjuna* (Roxb ex DC) Wt. et Am. in Kerala.

The bark and fruits of the tree without kernels are also potential sources of oxalic acid used for bleaching, as mordant in dyeing and calico-printing, and in photography, the extraction procedures of which has been given by Krishnamurthy (1993).

Bark is used as a tonic against heart diseases, contusions, fractures and ulcers. Decoction of bark with milk also serves as a tonic for heart patients. Fruits are also used in the preparation of a tonic and deobstruent. (Watt, 1889-93). Leaf juice is applied to ear to allay ear-ache.

### **Production and marketing**

On an average, one tree yield 9-45 kg of the tanning bark, which is gathered on a three years rotation basis from each tree (Anonymous, 1976). The Kerala State SC & ST Federation (1998) has no record on the quantity item gathered and marketed during 1994-95 to 1996-97 and therefore the cost of the item is also not authentically available.

### **Regeneration**

This somewhat frost and draught resistant tree is also capable of withstanding shade to a certain extent. Under natural conditions, seeds germinate when covered with soil or humus. But seeds in exposed conditions, often germinate and the seedlings soon perish due to the drying of the radicle. Also certain amount of shade, promote the growth of young seedlings. Coppicing is yet another means of regeneration of the species in natural conditions.

For artificial regeneration of *T. arjuna*, seeds can be collected from fruits which ripen during February to May. About 250 seeds weigh one kilogram and they can sown in nursery beds during April-May, thinly covered with soil and watered regularly (Troup, 1921). The seedlings will be ready to transplant during the next rainy season, before the tap roots become very long.

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- Kerala State SC & ST Federation 1998. Different items of LFPP handled during 1994-95 to 1996-97 and price fixed by MFP Committee per kilogram for 1997-98. Trivandrum (unpublished).
- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi. pp. 336. 369-370, 483.
- Troup, R. K. 1921. *Silviculture of Indian Trees*. vol. 2. Clarendon Press, Oxford. pp. 530-532.

Watt, George 1889-93. *A Dictionary of the Economic Products of India*. vol. 6. Govt. of India Press, Calcutta. pp. 16-17.

**147. TERMINALIA BELLIRICA (GAERTN.) ROXB.  
(Combretaceae)**

**Nomenclature**

*Terminalia bellirica* (Gaertn.) Roxb., Pl. Corom. 2: 54, t. 198. 1805 (as *bellerica*); Wt., Ic. Pl. Ind. Orient. t. 91. 1838; Bedd., Fl. Sylvat. South. India 19. 1869; Clarke in Hook. f., Fl. Brit. India 2: 445. 1878; Bourd., For. Trees Trav. 154. 1908; Rama Rao, Fl. Pl. Trav. 161. 1914; Gamble, Fl. Presid. Madras 1: 463. 1919; Nicol. *et al.*, Intrap. Hort. Malab. 85. 1988; Krishnam. Min. For. Prod. 100, 310, 337, 362, 369, 370, 408, 483. 1993.

*Myrobalanus bellirica* Gaertn., Fruct. 2: 90. 1791.

*Terminalia taria* Ham., Trans. Linn. Soc. London 17 (2): 159. 1835.

**Local name(s)**

Thanni, Thannika, Tusham.

**Description**

Deciduous **trees**, 15-20 m high; **branchlets** warty with persistent leaf-scars. **Leaves** simple, alternate, crowded towards the tips of branchlets, 10-20 x 7.5-15 cm, broadly-elliptic or elliptic-obovate, puberulous when young, glabrous on maturity, midrib prominent on both sides, cuneate, attenuate or obliquely obtuse at base, blunt or acuminate at apex; **petioles** 4-6.5 cm long, eglandular. **Flowers** pale greenish-yellow, foul-smelling, upto 0.5 cm across, in axillary, simple, pubescent spikes upto 8 cm long; **calyx** tubular and 5 lobed, pubescent outside, villous inside, with lobes upto 0.2 cm long, triangular and acute; **corolla** absent; **stamens** 10 in two series with filaments upto 0.2 cm long and subulate and very short anthers; **pistil** with upto 0.1 cm long and 1-loculed ovary, style almost 0.4 cm in length and simple stigma. **Drapes** upto 2.5 x 2 cm, subglobose, obscurely 5-angular, tomentose or velvety when young.

**Ecology**

Rather common trees in the deciduous and mixed forest tracts, especially along hill slopes and plains at lower elevations. Flowers during February to April and fruits ripen by November-December.

**Distribution**

Kerala

Cannanore, Wynad, Calicut, Malappuram, Palghat, Idukki, Pathanamthitta and Trivandrum districts; almost throughout the State, mostly confined to hilly uplands and highlands (Map 147).

**World**

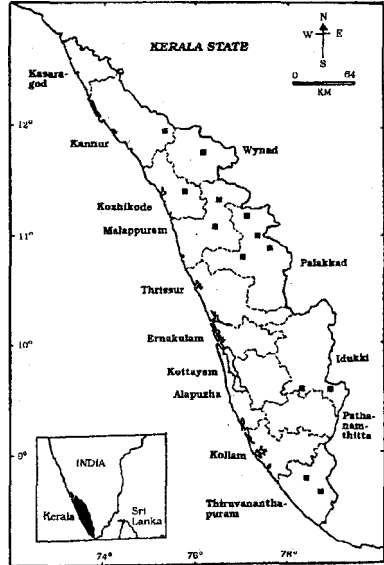
India, Sri Lanka, Myanmar, Indo-China, Malesia.

**Products and uses**

Belliric Myrobalan of commerce is the fruit of the tree which is a substitute for other categories of myrobalans used in tanning industry. The tannin content of the fruits is about 17% as reported by Chopra, *et al.* (1956). Kernels of seeds produce an oil, non-edible and used in soap manufacture.

Medicinally, ripe fruits form one of the constituents of 'Thribhala' (three fruits), used as an astringent and the pulp of fruits is medicinal against dropsy, piles, diarrhoea, leprosy, and so on. Mixed with honey, the fruit-pulp is

also medicinal for ophthalmia. Bark and fruits without kernels are used in the extraction of oxalic acid, as elaborated by Krishnamurthy (1993) and the seed-protein is useful in making cold and hot setting adhesives. The kernels also possess narcotic properties and in Central India, they are eaten along with beetle-nut and leaf as remedial for dyspepsia. They also contain about 25% oil used as a substitute for ghee and hair-oil.



Map 147. Distribution of *Terminalia bellirica* (Gaertn.) Roxb. in Kerala.

**Production and marketing**

It is mainly the dried fruit cover of the plant that is prepared and marketed as the non-wood forest produce. Even though a lot of the item goes into general market, the Kerala State SC & ST Federation (1998) had also received an unspecified quantity of the drug produce at the rate of Rs. 3.30 per kg which was sold for Rs. 3.50 per kilogram.

**Regeneration**

The tree is a light-demander and is sensitive to frost, but draught hardy. It coppices fairly well but pollards poorly. Seeds, whose flesh is eaten away by animals at the time of dispersal, also germinate in natural conditions, especially when partially or fully buried in moist soil.

For artificial regeneration of the tree, seeds can be collected during November to February, when the fruits ripen. In the field, direct sowing of seeds is



comparatively less effective than transplanting of nursery raised seedlings. In nursery, germination of seeds is almost 80-100% when sown fresh and 5-40% when they are stored for an year (Troup, 1921). Nuts or whole fruits can be sown in the nursery during March-April, covered with a thin layer of soil and watered regularly. Seeds germinate within two months after sowing and the seedlings can be transplanted during the rainy season, either intact or after pruning the stem and root portions.

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- Kerala State SC & ST Federation 1998. Different items of LFPP handled during 1994-95 to 1996-97 and price fixed by MFP Committee per kilogram for 1997-98. Trivandrum (unpublished).
- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi. pp. 369-370.
- Troup, R. K. 1921. *Silviculture of Indian Trees*. vol. 2. Clarendon Press, Oxford. pp. 507-511.

## 148. TERMINALIA CHEBULA RETZ. (Combretaceae)

### Nomenclature

*Terminalia chebula* Retz., Obs. 5: 31. 1789; Wt. et Arn., Prodr. 313. 1834; Bedd., Fl. Sylvat. South. Indiat. 27. 1869; Clarke in Hook.f., Fl. Brit. India 2: 446. 1878; Bourd., For. Trees Trav. 154. 1908; Rama Rao, Fl. P1. Trav. 161. 1914; Gamble, Fl. Presid. Madras 1: 464. 1919; Krishnam., Min. For. Rod. India 15, 100, 310, 336337, 362, 408. 1993.

### Local names

Kadukka.

### Description

**Trees**, 15-20 m high; **bark** brown, often shallowly fissured vertically. **Leaves** simple, opposite or subopposite, 4.5-13 x 3-7 cm, elliptic-oblong, silky hairy when young, subglabrous or almost glabrous



Fig. 46. *Terminalia chebula* Retz.

when mature, rounded or subcordate at base, acute or acuminate at apex; **petioles** upto 2 cm long, pubescent with two glands at the apex. **Flowers** greenish-white, fragrant in terminal panicles of spikes; **bracteoles** longer than the flowers, hairy, linear, acute, deciduous; **calyx** upto 0.3 cm long, campanulate, expanded towards mouth, obscurely 5-toothed, glabrous externally, hairy inside; **corolla** absent; **stamens** 10 in two rows inserted on the calyx with filiform, exerted filaments, 0.4-0.6 cm long and small, didymous anthers; **pistil** with I-loculed ovary and simple stigma. **Drupes** 1.5-3.5 cm long, greenish-yellow, pendulous on trees, ellipsoid or obovoid, obtusely 5-ribbed, glabrous; **seeds** oblong, thick, obscurely angled (Fig. 46).

### Ecology

Moderate sized trees of restricted distribution, confined to mostly dry deciduous, lateritic forest tracts of high elevations like Munnar, Thekkady and Trivandrum in Kerala. Flowers in March-April and fruits mature during November to January.

### Distribution

Kerala

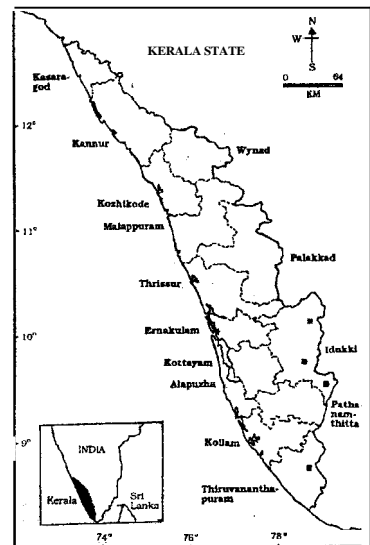
Idukki and Trivandrum districts; confined to the highlands (Map 148).

World

From subhimalayan tracts to Peninsular India, Myanmar.

### Products and uses

Fruits which constitute one of the most important vegetable tannin sources called Chebulic Myrobalan is the main product extracted from the tree which is also medicinal. During January to April mature fruits are collected by shaking the tree and are shade-dried and used in tanning industry, especially in the manufacture of sole leather. It is also used in the manufacture of ink. The tannic acid from fruits also finds its use in the treatment of locomotive feed waters and forms an additive in oil drilling media. Further, as a mordant, the tannic acid from Chebulic Myrobalan is used in dyeing. This non-wood forest product is also of much export potential. Bark, fruits and seeds of this plant are medicinal and fruits constitute one of the ingredient in the drug combination 'Tribhala' (three fruits) in the Ayurvedic system of Indian medicine, extensively used in various prepa-



Map 148. Distribution of *Terminalia chebula* Retz. in Kerala.

rations as curative for an array of diseases. Krishnamurthy (1993) has given details on the processing and uses of this product of myrobalan.

The seeds of *T. chebula* is the source a yellowish edible oil with pleasant odour and agreeable taste, which constitute about 36% of the seed weight. The fruits are also used to increase the potency of alcoholic spirits.

### **Production and marketing**

Dried fruits of the tree is the Chebulic Myrobalan of commerce. During 1994-95 to 1996-97, The Kerala State SC & ST Federation (1998) received about 12,399kg of the produce through various tribal welfare societies in the State. The procurement cost of the item by the Federation was Rs. 4.20 per kg which was sold at the rate of Rs. 4.50 per kg with a net profit of Rs. 3720.00 during the period. Also, Shiva, *et al.* (1996) had reported that, during 1970-71, 1980-81 and 1990-91, the export of the item from India was, 196.20 tonnes, 88.55 tonnes and 313.05 tonnes, respectively, fetching a total income of about Rs. 18 million. In addition, the tannin extract of the dried fruits is also exported from India. In fact, to meet the domestic requirements, about 20.55 tonnes of Chebulic myrobalan was also imported to the country during 1980-81.

### **Regeneration**

The tree is a light demander and production of fruits is also directly related to this. It is also a frost-hardy and draught and fire resistant tree to a certain extent. The trees coppice well but rarely produce root suckers. However, natural regeneration of the species from seeds is much affected by the large scale removal of the seed crop as the product myrobalan. Fruits ripen during October to March and seeds dispersed during that period germinate better when fallen and covered by debris or soil. Draught and fire may not affect the seeds and germination may be prolonged to more than a year, especially when deeply buried in soil (FRI, 1983).

For artificial regeneration of the tree, fallen seeds are used after drying, which can also be stored for about a year. However, Dent (1945) had noted that fresh seeds germinate faster than stored ones. Also, seeds dispersed and lying in soil for 1 or 2 years germinate better than fresh ones. Pre-treatments like fermentation, chipping the broad end and then soaking in water can enhance the germination of seeds from 35% to 80%. Hot water treatment can also improve the germination percentage, marginally. Seed weight vary considerably in samples collected from different part of India from 140 per kg to 790 per kg and germination is around 60%, irrespective of the seed weight. In the nursery, treated seeds can be sown in shaded beds and watered. Also, outplanted seedlings may have to be shaded for their better survival. Direct

sowing of seeds and stump planting are also methods by which the plant can be regenerated (FRI, 1983). In all cases, protection from grazing, weeding, thinning whenever required and protection from pests and diseases are essential for the better success of artificially regenerated stands. On an average, the girth increment of outplanted seedlings is about 0.6-0.7 cm in a year (FRI, 1983).

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- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi. pp. 336-338.
- Shiva. M.P., S. Aswal, A. Sharma, P. Mathur and R. Chandra 1996. *Trends of Export and Import of the Minor Forest Products in India*. Centre for Minor Forest Products, Dehra Dun. 38 p.

## 149. THOTTEA SILIQUOSA (LAMK.) DING HOU (Aristolochiaceae)

### Nomenclature

- Thotteasiliquosa* (Lamk.) Ding Hou, *Blumea* 27: 327. 1981; Nicol., et al., *Intrp. Hort. Malab.* 60. 1988.
- Apama siliquosa* Lamk., *Encyl. Meth. Bot.* 1:91. 1783; Gamble, *Fl. Presid. Madras* 2: 1200. 1925.
- Apama dubia* J.F. Gmel., *Syst. Veg.* 2: 1153-1792, nom. illeg. (incl. type of *A. siliquosa* Lamk. 1783).
- Bragantia wallichii* R.Br. ex Wt. et Arn., *Edinb. New Philos. J.* 15: 181. 1833; Wt., Ic. *Pl. Ind. Orient.* t. 520. 1840-43; Hook.f. in Hook.f., *Fl. Brit. India* 5: 73. 1886; Rama Rao, *Fl. Pl. Trav.* 335. 1914.

### Local name(s)

Alpam, Kottashari.

### Description

Erect or rarely scandent slender **shrubs** or **undershrubs**, 0.5-1.5 m high; **branchlets** swollen at nodes, finely pubescent; **bark** smooth, yellowish. **Leaves** simple, distichous, 10-18 x 3.5-6 cm, oblong-lanceolate, entire, glabrous above, stellately pubescent and paler beneath, strongly 3-nerved

from the base with reticulate veins between the nerves, subacute at base, acutely acuminate at apex; **petioles** 0.2-0.5 cm long, stout. **Flowers** dark purple in axillary, irregular, few-flowered cymes; **bracts** small, linear, acute, pubescent; **pedicels** 1-2.5 cm long, densely pubescent; **perianth** 3-partite with each segment 0.2-0.3 cm long, broadly ovate or suborbicular, pubescent, concave, fleshy; **stamens** 5 in three groups, adnate to the style with hairy anthers; **pistil** with elongate, 4-loculed ovary, thick style column and 3 or more linear stigmas. **Capsules** 6-9.5 cm long, straight, obtuse, 4-gonous; **seeds** 3-gonous, upto 0.2 cm long, acute at both ends, deeply pitted (Fig. 47).



Fig. 47. *Thottea siliquosa* (Lamk.) Ding Hou

**Ecology**

Shade loving shrubs with few weak branches and distichous leaves from very near the base, rather common in the moist deciduous and semi-ever-green forests. Flowers during October to February and bearing fruits by April-May.

**Distribution**

Kerala

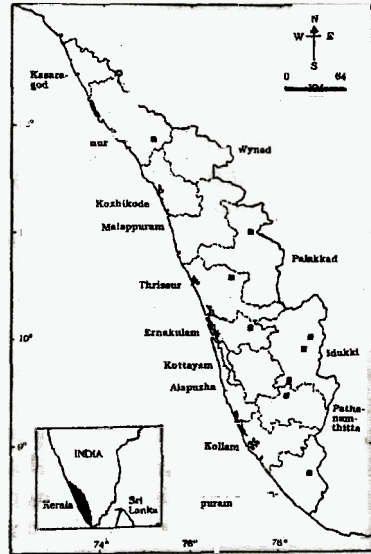
Cannanore, Palghat, Trichur, Emakulam, Idukki, Pathanamthitta and Trivandrum districts; almost throughout Kerala, from the mid to the highlands (Map 149).

World

India, Sri Lanka.

**Notes**

*T. siliquosa* is very similar to *T. barberi*, but can be distinguished by the presence of leaves with a basal pair of nerves next to the midrib reaching about 2-3 of its length, stamens usually 9, arranged in three groups dorsal surface of anther and style lobes densely covered with hooked hairs and nerves 3-4 pairs from the mid rib in *Thottea siliquosa* (Lamk.) Ding Hou.



Map 149 Distribution of *Thottea siliquosa* (Lamk.) Ding Hou in Kerala.

### Products and uses

Roots of *Thottea siliquosa* are medicinal in the Indian systems of treatment, as curative for diarrhoea and dysentery, often administered along with lemon juice. Also, Nambiar, et al. (1985) had reported that a preparation of the plant is beneficial for carbuncles and inveterate ulcers. Mary, et al. (1977) have also recorded that a paste prepared from the plant with oil is effective against chronic sores and ulcers.

### References cited

- Mary, Z., S.N. Yoganarasimhan, J.K. Pattanshetty and R.C. Nayar 1977. Pharmacological studies on the root of *Apama siliquosa* Lamk. (Aristolochiaceae). *Proc. Indian Acad. Sci.* 85 B: 412-419.
- Nambiar, V.P.K., N. Sasidharan, C. Renuka and M. Balagopalan 1985. Medicinal Plants of Kerala Forests. KFRI Research Report No. 42. KFRI, Peechi. p. 113.

## 150. TINOSPORA CORDIFOLIA (WILLD.) MIERS EX HOOK.F. ET THOMS. (Menispermaceae)

### Nomenclature

*Tinospora cordifolia* (Willd.) Miers ex Hook.f. et Thoms., *Fl. Indica* 1: 184. 1855; Hook.f. et Thoms. in Hook.f., *Fl. Brit. India* 1:97. 1872; RamaRao, *Fl. Pl. Trav.* 10. 1914; Gamble, *Fl. Presid. Madras* 1:26. 1915; Sant. et Janrdh., *Bull. bot. Surv. India* 10:368. 1963; Forman, *Kew Bull.* 36:403. 1981; Nicol. et al., *Intrp. Hort. Malab.* 180. 1988; Krishnam., *Min. For. Prod. India* 100-101. 1993.

*Menispermum cordifolium* Willd., *Sp. Pl.* ed. 4, 4: 826. 1806.

*Cocculus convolvulaceus* DC., *Syst. Veg.* 1:518. 1817.

*Cocculus cordifolius* (Willd.) DC., *Syst. Veg* 1:518. 1817 & *Prodr.* 1:97. 1824; Wt. et Arn., *Prodr.* 12. 1834; Wt.,  *Ic. Pl. Ind. Orient.* t. 4854-86. 1840-43.

### Local name(s)

Chittamruthu. Sitha-amruthu.

### Description

Shrubby **climbers** with filiform aerial roots, 3-6 m high; **stems** glabrous, striate when young, succulent; **bark** corky, papery, often grooved. **Leaves** simple, alternate, 4- 14 x 4- 12 cm or larger, broadly cordate or subdeltoid, palmately 5-7 nerved at base, membranous, glabrous, often glandular papillose in nerve axils beneath, broadly sinuate at base, abruptly acuminate at apex; **petioles** 2-6 cm long, glabrous. **Flowers** greenish-yellow in axillary or terminal, dioecious racemes from mature stem, often much longer than the leaves; **male flowers** with 0.2-0.3 cm long slender pedicels, 3 outer and 3 inner ovate, free sepals as in male flowers, 6 broadly spatulate, upto 0.2 cm long, corolla with

6 free obovate, reflexed petals; **stamens**, 6, enclosed by petals with clavate filaments; **female flowers** with lanceolate outer sepals, obovate inner sepals and 6 broadly-spathulate petals; **pistil** with 3 carpels, stout style and forked stigma. **Drupes** red, sessile, 0.5-0.7 cm long, ovoid, convex and obscurely ridged dorsally, flat ventrally with subterminal stylar scar.

### Ecology

Lianas, often climbing on stunted trees, hedge plants and such supports in the plains, forest outskirts, open areas and such habitats, mostly in moist deciduous forests. Flowering during February to May and fruits are red and mature during May to July.

### Distribution

Kerala

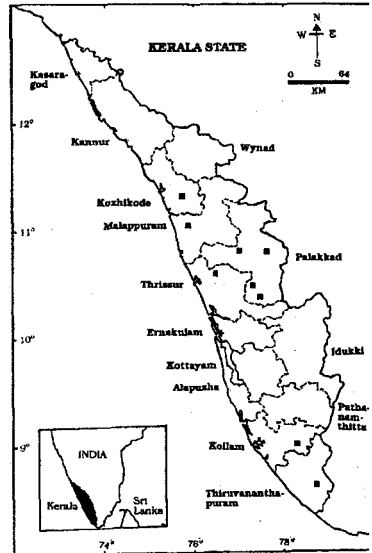
Calicut, Malappuram, Palghat, Trichur, Quilon and Trivandrum districts; mainly in the mid and hilly uplands (Map 150).

World

India, Sri Lanka, Bangladesh.

### Notes

The type specimen of *Tinospora crispa* (L.) Hook.f. et Thoms. var. *nitidiuscula* Miers, an unnumbered collection of Hooker and Thomson from Khasia Hills, is a sterile twig, but almost certainly belonging to this species, which is known to occur in Assam (Forman, 1981).



Map 150 Distribution of *Tinospora cordifolia* (Willd.) Miers ex Hook f et Thoms in Kerala

### Products and uses

Stem, root and leaves are the commonly exploited parts of this plant, for medicinal use, of which, the stem contribute a major share. Dried and powdered roots in combination with ghee or honey is also a tonic and curative for jaundice and rheumatism. The vegetative parts of the plant form constituents in several ayurvedic preparations used in the treatment of general debility, dyspepsia, urinary infections, and so on. The stem also yields starch of medicinal value. Parts of *Tinosporasinensis* (Lour.) Merr: (syn. *T. malabarica* (Lamk.) Miers also possess similar properties, even though in Kerala, it is considered to be of inferior therapeutical value (Mooss, 1977). According to Kanjilal and Das (1934), elephants are fond of the aerial roots which are considered to be a good tonic for them. Porus wood is scrapped and mixed with the juice of *Calatropis* and can be applied to scorpion bites with great efficiency.

**Production and marketing**

Green (fresh) stem of the plant is the part gathered and marketed as the non-wood forest produce. The Kerala State SC & ST Federation (1998), through its network of collection centres in Kerala, gathered about 236 kg of the medicinal stem at the cost of about Rs. 3.00 per kilogram. This is only a very small fraction of the actual quantity of the item collected and marketed, as a major share of the product is handled by medicinal plant and hill-produce dealers of the State.

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- Kerala State SC & ST Federation 1998. Different items of LFPP handled during 1994-95 to 1996-97 and price fixed by MFP Committee per kilogram for 1997-98. Trivandrum (unpublished).
- Mooss, N.S. 1977. Single Drug Remedies. Vaidyasarithi Press, Kottayam.

**151. TOONA CILIATA ROEM.**  
(**Meliaceae**)

**Nomenclature**

- Toona ciliata* Roem., Syn. Hesp. 139. 1846; Sant., Bull. bot. Surv. India 3: 13. 1962; Krishnam., Min. For. Prod. India 265,339,363,516. 1993.
- Cedrela toona* Roxb. ex Rottl. et Willd., Ges. Naturf. Fr. Neue Schr. 2: 198. 1803; Wt. et Arn., Prodr. 124. 1834; Wt., Ic. Pl. Ind. Orient. t. 161. 1839; Bedd., Fl. Sylvat. South. India t. 10. 1869; Hiern in Hook. f., Fl. Brit. India 1: 568. 1875; Bourd., For. Trees Trav. 81. 1908; Rama Rao, Fl. Pl. Trav. 77. 1914; Gamble, Fl. Presid. Madras 1: 187. 1915.
- Cedrela toona* Roxb. ex Rottl. var. *listeri* C. DC., Rec. bot. Surv. India 3: 370. 1908.

**Local name(s)**

Mathagiri-vembu, vembu.

**Description**

Evergreen **trees**, 20-25 m high with dense crown; **bark** brown, flaking off as thin pieces. **Leaves** imparipinnate, upto 50 cm or more long; **leaflets** opposite or alternate, 8-20 pairs, 4.5-15 x 1.5-6.5 cm, lanceolate or ovate-lanceolate, glabrous, entire or slightly undulate, inequilateral at base, acuminate or acute at apex; **petiolules** 0.5-1 cm long, stout. **Flowers** white, honey-scented in terminal, drooping, pubescent panicles, as long as the leaves; **pediceis** short,



slender; **calyx** 5-lobed with lobes orbicular ovate, ciliate along margins; **corolla** with 5 petals, upto 0.5 cm long, broadly elliptic, ciliate along margins, keeled at the base inside; **stamens** 5, inserted on each of the orange-coloured, hairy lobes of the disc with subulate filaments and oblong, cordate, apiculate anthers; **pistil** with 5-loculed, ovoid or subglobose, hairy, sessile ovary and discoid stigma upto 0.1 cm across. **Capsules** upto 2.5 cm long, oblong or ovoid, 5-loculed, 5-valved, septifragal; **seeds** winged, almost 2 cm long including the wings.

### Ecology

Lofty trees, fairly common in valleys, along river banks and fringes of sholas in evergreen, semi-evergreen and moist deciduous forests, forming a component of the top canopy layer. Flowering during November to January, continuing sometimes upto April and fruits ripen in June-July or by October.

### Distribution

#### Kerala

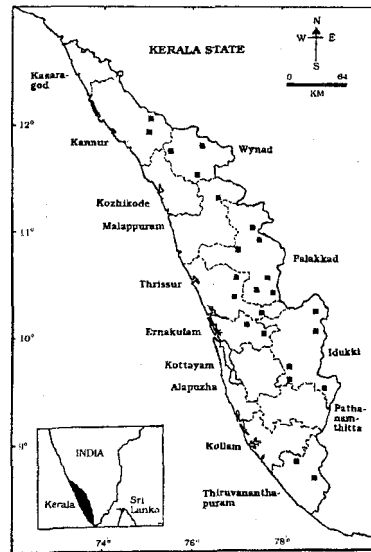
Cannanore, Wynad, Malappuram, Palghat, Trichur, Emakulam, Idukki and Trivandrum districts; mainly in the hilly uplands and highlands (Map 151).

#### World

India, Java, Australia.

### Products and uses

Bark and flowers which are medicinal, contain a red colouring matter called nycarthrin used for dyeing cotton and woollen fabrics are the non-wood products extracted from this tree. The bark possesses astringent and antiperiodic properties and is used externally for healing ulcers and leprosy.



Map 151 Distribution of *Toona ciliata* Roem in Kerala

The tree yields a gum used as an adhesive and flowers and seeds produce a yellowish-red or red dye (Krishnamurthy, 1993). The timber, apart from its use in construction work, is also used for making tea-chests, cigar boxes, shuttles, picking sticks in textile industry, etc.

### Regeneration

The tree coppices well under favourable conditions and seeds dispersed from mother trees by the beginning of rainy season also germinate in natural conditions, if not washed away by rains.

For artificial regeneration of *T. ciliata*, ripened fruits can be collected during May from the mother trees and not those fallen on the ground. Fruits, after 3-4 days of sun-drying, may be beaten with sticks and seeds separated and winnowed. One kilogram of fruits contain about 200 gm of cleaned seeds. The seeds can be stored for about a year with care (Dent, 1948), even though loss of viability by storage has also been reported (FRI, 1981). One kilogram contain about 1,400,000 to 2,50,000 numbers of seeds. Seeds can be sown in shaded nursery beds during May. Watering is essential till the seedlings attain pottable height. The nursery raised seedlings can be transplanted in the same rainy season or pricked into polythene bags to plant them during the second rains. Direct sowing of seeds in the field soon after collection is also in practice, especially in undulating terrains. However, the species is best regenerated by stump-planting with better survival and growth as compared to planting of seedlings (Kadambi & Dabral, 1955). The stumps can also be stored for about 3 weeks in moist sacks. Side shade for planted stumps can ensure better success in their sprouting. In the first season of planting, shading, weeding and loosening of soil will help in the survival and better growth of seedlings. Thinning schedule has also been standardised (FRI, 1981) for the plantations of the species. Also, attack of insect pests in the young plantations has been reported. Normally, by about 35 years of growth, the trees attain a height of about 25 m and diameter of 56 cm (Dabral, 1959).

### References cited

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- Dent, T.V. 1948. The storage of seeds of Indian forest plants *Indian Forest Records -New Series 7(1) Silviculture*. Manager of Publications, New Delhi. 134 p.
- FRI, 1981. *Troup's Silviculture of Indian Trees*. vol. 3. Controller of Publications, Delhi. pp. 188-196.
- Kadambi, K. and S.N.Dabral 1955. Studies on the suitability of different methods of artificially regenerating forest trees. *Indian For.* 81: 129-151.
- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi. p. 363.

## 152. TRIBULUS TERRESTRIS L. (Zygophyllaceae)

### Nomenclature

*Tribulus terrestris* L., Sp. Pl. 387. 1753; Hook. f. in Hook. f., Fl. Brit. India 1: 423. 1874; Rama Rao, Fl. Pl. Trav. 57. 1914; Gamble, Fl. Presid. Madras 1: 130. 1915; Krishnam., Min. For. Prod. India 101. 1993.

*T. lanuginosus* L., Sp. Pl. 387. 1753; Wt. et Arn., Prodr. 145. 1834; Wt., Ic. Pl. Ind. Orient. t. 98. 1838.

### Local name(s)

Nerinjil, Nerinnil.

### Description

Prostrate annual or perennial **herbs**; **branchlets** slender, spreading, silky-villous on young parts. **Leaves** pinnate, opposite, 2-4 cm long; **leaflets** subsessile, 4 or 6 pairs, usually pairs unequal, about 0.7 x 0.4 cm, oblong, entire, rounded or oblique at base, acute and mucronate at apex; **petioles** upto 0.7 cm long with reduced petiolules; **stipules** 2 or 3 in a cluster, upto 0.3 cm long, lanceolate. **Flowers** golden-yellow, solitary, pseudo-axillary or leaf-opposed; **sepals** 5, linear; **petals** 5, often not exceeding the calyx in length; **disc** annular, 10-lobed; **stamens** 5 + 5, subtended by 5 glandular scales and filaments upto 0.3 cm long; **pistil** with globose or lobed, hirsute, 5-loculed ovary with axile placenta, style upto 0.2 cm long and 5 or more lobed stigma. **Schizocarps** 5-angled or winged with 5 woody cocci, each with a pair of unequal, stiff, sharp, divaricate spines towards the distal half and two shorter ones near the base; **seeds** solitary in each coccus.

### Ecology

Very common in dry, rocky areas of the dry deciduous forests; flowering and fruiting during the summer months of April to May.

### Distribution

Kerala

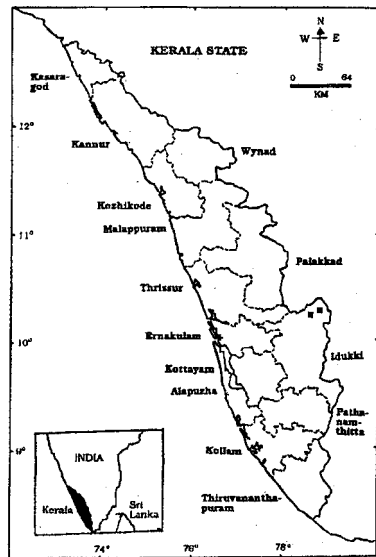
Chinnar in Idukki District (Map 152).

World

Throughout India, western Tibet and Sri Lanka.

### Products and uses

The green plant at the post floral stages is rich in Calcium and contains crude protien, crude fibre, phosphorous nutrients, etc. The alkaloids Harman has been reported from the herb and Hermine from its seeds. The plant contains saponins; which, on hydrolysis, yield steroidal saponins. The fruits also contain alkaloids, resins a fixed



Map 152. Distribution of *Tribulus terrestris* L. in Kerala.

oil, tannins, reducing sugars, sterols, an essential oil, nitrates, peroxidase, diastase and traces of a glucoside.

The leaves and tender shoots of the plant are used by the poor class as a pot herb, either alone or along with other herbs. The flour from the fruits is made into a bread and eaten during the times of food scarcity. The herb is also a fodder plant. Fruits, which are the officinal part, is used in the preparation of several Ayurvedic medicines and is a constituent of the drug combination 'Dasamoola'. Due to the diuretic action of the fruits, it is found to be highly beneficial in renal calculus, difficult micturition, chronic cystitis and other genito-urinary disorders. It is also cooling, demulcent, tonic and aphrodisiac, promotes strength and digestive power and is useful in cough, difficulties in breathing, diabetes, piles, rheumatism, dropsy, burning sensation, impotence and diseases of heart (Nadkarni, 1954; Kolammal, 1979) and kidney (Krishnamurthy, 1993).

The leaves are diuretic and tonic which enrich the blood, promotes menstrual flow, cure gonorrhoea and also gheet. A decoction of it is useful as a gargle for mouth troubles and painful gums, reduce inflammation and a paste prepared from it is used in the treatment of bladder stones (Kirthikar and Basu, 1918). The root is also medicinal as stomachic and appetiser, diuretic, carminative and cures lumbago in the Yunani system of medicine.

### References cited

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- Kolammal, M. 1979. *Pharmacognosy of Ayurvedic Drugs*. vol. 2. Trivandrum. p. 57.
- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi. pp. 101-102.
- Nadkarni, A.K. 1954. *Indian Materia Medica*. Bombay. p. 1230.

### 153. TRICHOSANTHES CUCUMERIANA L. (Cucurbitaceae)

#### Nomenclature

*Trichosanthes cucumerina* L., Sp. Pl. 1008. 1753; Wt. *et* Arn., Prodr. 349. 1834; Clarke in Hook.f., Fl. Brit. India 2: 609. 1879; Rama Rao, H. Pl. Trav. 184. 1914; Gamble, Fl. Presid. Madras 1: 529. 1919; Chakrav., Rec. bot. Surv. India 17: 31. 1959 & Fasc. Fl. India 11: 112. 1982; Jeff., Kew Bull. 34: 796. 1980; Nicol. *et al.*, Intrap. Hort. Malab. 100. 1988.

*Trichosanthes anjuina* L., Sp. P1.1008.1753; Wt. et Arn., Prodr. 350.1834; Clarke in Hook. f., Fl. Brit. India 2: 610.1819; Gamble, Fl. Presid. Madras 1: 529. 1919.

### Local name(s)

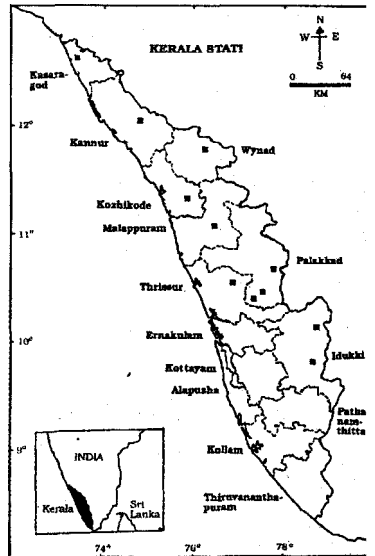
Kattu-padavalam, Padavalam, Papatolam, Peppadal.

### Description

Annual, foetid, tendril **climbing herbs**, 2-4 high; **stem** light green, shallowly furrowed, sparsely hairy or subglabrous; **tendrils** light green, 2-3 fid, 6-15 cm long. **Leaves** alternate, simple, palmately and deeply 5 (rarely 3-7) lobed, 6-12 cm long, often broader than long, orbicular, reniform or broadly ovate, distantly denticulate; **lobes** broad, glabrous above, pubescent beneath, acute at apex; **petioles** 2-7.5 cm long, striate, pubescent. **Flowers** white in axillary racemes; **male flowers** white in axillary, 4-15 cm long, racemes with a solitary flower also from the same axil; **pedicels** 0.5-2 cm long, puberulous; calyx 1.5-2.5 cm long, tabular, dilated at apex with acute, glandular-pubescent with triangular or linear lobes; **corolla** upto 1.2 cm long with lanceolate-oblong petals, lacinate at apex; **stamens** 3, inserted on the calyx tube with very short filaments and included anthers, one 1-loculed and the other two 2-loculed with narrow connectives; **pistillodes** 3, filiform; **female flowers** solitary, axillary; **pedicels** 0.3-1.5 cm long; calyx tube upto 5 cm long, produced beyond the ovary; **staminodes** absent; **pistil** with inferior, ovoid or fusiform, 1-loculed, ribbed, pubescent ovary, slender style and 3-fid stigma. **Fruits** 2.5-7 cm long, ovoid or fusiform, tapering at both ends, beaked at apex, green, striped with white when young, scarlet when ripe; **seeds** 0.3-0.4 cm long, ellipsoid, compressed, rugulose, embedded in red pulp.

### Ecology

Rare, often climbing on bushes or on hedges in the fringes of evergreen, semi-evergreen and moist deciduous forests, and also in the plains. Flowers during August to December and fruits mature by February-March. Due to over-exploitation, and that too the whole plant as such, the species has become very scarce in the natural forests of Kerala.



Map 153 Distribution of *Trichosanthes cucumeriana* L. in Kerala

### **Distribution**

#### **Kerala**

Kasaragod, Cannanore, Wynad, Calicut, Malappuram, Palghat, Trichur and Idukki districts; mainly from the mid to the highlands of northern and central parts of the State (Map 153).

#### **World**

India, Sri Lanka, Malesia, North Australia.

### **Products and uses**

Almost all parts of this plant are medicinal and therefore it is often destructively extracted from the natural forests and sold as such in the market. Seeds are reported to contain about 28% of a drying oil with properties comparable to tung oil (Anonymous, 1976) that possess haemagglutinating activity.

### **Production and marketing**

The aerial parts of the plant as a whole is gathered and marketed, either fresh or in the dried form, as the drug produce. Most of the fresh collections goes into local glossary shops and only dried material was procured by the Kerala State SC & ST Federation (1998) at the rate of Rs. 28.50 per kilogram. The Federation disposed off the item at the rate of Rs. 30.00 per kg during 1994-95 to 1996-97 and a total of 22,825 kg of the drug produce was available to them during the period.

### **Regeneration**

The plant can be grown as a rainy season crop. The land may be ploughed, cleared of weeds and square pits of 60-90 cm dimension are to be taken first (Anonymous, 1976). The pits may be 3/4 filled with a mixture of farmyard manure or compost and loose soil. The pits are to be watered regularly for 3-4 days, three or four seeds are to be sown in each pit at a depth of about 4.5 cm. For easy germination, the seeds may be soaked in water, a day before planting. Germination will be over within a week under normal conditions and in cold or dry situations, this may be delayed. If stored in dry boxes, the seeds remain viable for about 2 years (Anonymous, 1976).

### **References cited**

- Anonymous, 1976. *The Wealth of India: Raw Materials*. vol. 10. CSIR, New Delhi. p. 286.
- Kerala State SC & ST Federation 1998. Different items of LFPP handled during 1994-95 to 1996-97 and price fixed by MFP Committee per kilogram for 1997-98. Trivandrum (unpublished).

**154. TYLOPHORA INDICA (BURM.F.) MERR.**  
(Asclepiadaceae)

**Nomenclature**

*Tylophora indica* (Burm.f.) Merr., Philipp. J. Sci. 19: 373. 1921; Nicol. *et al.*, Intrap. Hort. Malab. 64. 1988; Krishnam., Min. For. Prod. India 102. 1993.

*Cynanchum indicum* Burm.f., Fl. Ind. 70. 1768.

*Tylophora asthmatica* (L.f.) Wt. *et* Am. in Wt., Contrib. Ind. Bot. 51. 1834; Wt., Ic. Pl. Ind. Orient. t. 1277. 1848; Hook.f. in Hook.f., Fl. Brit. India 4: 44. 1883; Rama Rao, Fl. Pl. Trav. 263. 1914; Gamble, Fl. Presid. Madras 2: 843. 1921.

*Asclepias asthmatica* L.f., Suppl. Pl. 171. 1781.

*Asclepias prolifera* Ainslie, Materia Indica 2: 225. 1826; Mabb., Taxon 26: 536. 1977.

**Local name(s)**

Valli-pala.

**Description**

Twining or straggling shrubaceous **climbers** with milky latex, 1.5-2.5 m high; **branchlets** pubescent or slightly hairy. **Leaves** simple opposite, 2.5-9 x 1-5.5 cm, broadly ovate to ovate-oblong, thick, slightly fleshy, puberulous or glabrescent above, densely puberulous beneath, truncate or subcordate at base, acute, obtuse and apiculate at apex; **petioles** 0.5-2 cm long, puberulous. **Flowers** greenish-yellow or purplish, sessile, in axillary, hairy, puberulous or rarely glabrous, upto 2 cm long, umbellate cymes; **calyx** lobes spreading, upto 0.2 cm long, lanceolate, acute, hairy or glabrous; **corolla** brownish tinged inside, upto 1.5 cm across the tube, lobed; **stamens** in a column arising from the corolla base with erect anthers with membranous appendages and minute pollen masses attached with slender caudicles; **pistil** with pentagonal or 5-lobed, depressed, flattened or convex style apices. **Merocarps** 6-9 cm long, finely striate, glabrous, tapering to an acute, slender beak; **seeds** upto 1 cm long, broadly ovate with 1-2.5 cm long, white coma (Fig. 48).



Fig 48 *Tylophora indica* (Burm f ) Merr.

**Ecology**

Rather common as stragglers or climbers along hedges of forest fringes,

especially in moist deciduous areas. Flowers during February-March and fruits mature by April-May.

### Distribution

#### Kerala

Cannanore, Wynad, Calicut, Malappuram, Palghat, Trichur, Idukki, Pathanamthitta, Quilon and Trivandrum districts; almost throughout the State, in the hilly uplands and highlands (Map 154).

#### World

From Seychelles through India and Sri Lanka to South-East Asia including Malasia.

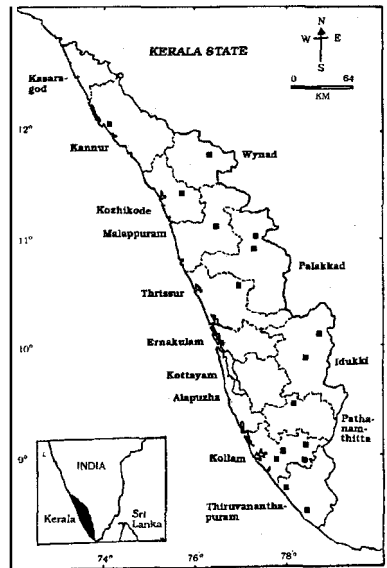
### Products and uses

Roots, stems and leaves are the parts of this plant extracted for medicinal purposes. Roots of *Tylophora indica* possess stimulative, emetic, cathartic, expectorant and diaphoretic properties and is used in the treatment of diseases

like asthma, bronchitis, whooping cough, dysentery, etc. The roots also have bacteriostatic properties and therefore is an effective food preservative. Leaves, stem and roots are also used in hydrophobia and leaves especially are used to destroy vermin. Leaf and stem contain the alkaloid tylophorine and roots is the source of the anti-tumour alkaloid tylophorinidine (Anonymous, 1976). These alkaloids are potential to produce itching, redness, swelling and eruption of the skin. It has also been reported (Anonymous, 1976) that leaf and stem extracts of the plant show anti-cancer activity in mice. Now a days, the leaves of the plant are much used in the treatment of bronchial asthma with high degree of relief, even though side effects like sore-mouth, loss of taste, vomiting, etc. are reported. The plant also yields a fine and silky, strong fibre from its bark.

### Reference cited

Anonymous, 1976. *The Wealth of India: Raw Materials*. vol. 10. CSIR, New Delhi. pp. 398-399.



Map 154 Distribution of *Tylophora indica* (Burm. f.) Merr in Kerala



**155. URARIA LAGOPODIODES (L.) DESV.  
(Papilionaceae)**

**Nomenclature**

*Uraria lagopodioides* (L.) Desv., J. Bot. 1: 22. 1813 & DC., Prodr. 2: 324. 1825 (as '*lagopoides*'); Wt., Ic. Pl. Ind. Orient. t. 289. 1840; Wt. et Arn., Prodr. 222. 1834; Baker in Hook.f., Fl. Brit. India 2: 156. 1876 (as '*lagopoides*'); Gamble, Fl. Presid. Madras 1: 336. 1918; Meeuwen et al., Reinwardtia 5: 419-456. 1961; Raiz., Indian For. 9 2 325. 1966.

*Hedysarum lagopodioides* L., Sp. Pl. 1198. 1753.

*Uraria alopecuroides* Sw., Hort. Brit. (ed. 2): 148. 1830; Gamble, Fl. Presid. Madras 1: 237/ 1918; Wt., Ic. Pl. Ind. Orient. t. 290. 1840.

*Doodia lagopodioides* (L.) Roxb., Hort. Beng. 57. 1814 (*nom. nud.*) & Fl. Indica 3: 366. 1832.

*Ururia repanda* Wall. ex Benth., Pl. Jungh. 213. 1852; Baker in Hook.f., Fl. Brit. India 2: 156. 1876.

**Local name(s)**

Orila.

**Description**

Straggling **undershrubs**, upto 2 m long; **branchlets** slender, pubescent. **Leaves** compound, alternate; **leaflets** 3.5-7 x 2-5 cm, oblong, entire, glabrous above, soft-hairy beneath, rounded or cordate at base, subacute at apex; **petioles** 2.5-3 cm long, densely brownish hairy. **Flowers** purple or yellow, upto 0.5 cm long, in terminal racemes of upto 20 cm length, densely hairy; **calyx** tubular and 2-lipped, upto 0.4 cm long with the lower lobe setaceous; **corolla** upto 0.5 cm long with the standard petal orbicular or ovate and clawed and wing petals oblong-falcate adherent to the obtuse keel petals; **stamens** 10, diadelphous (9+1) with uniform anthers; **pistil** with sessile or shortly stalked ovary, filiform style and capitate stigma. **Pods** 2 jointed lomentum covered by densely setaceous, plumose, persistent calyx.

**Ecology**

A highly variable species, rather common in grassy grounds along forest pathsides and roadsides, as on undergrowth in teak and other forest plantations, etc. in moist deciduous areas. Flowering and fruiting during November-December.

**Distribution**

Kerala

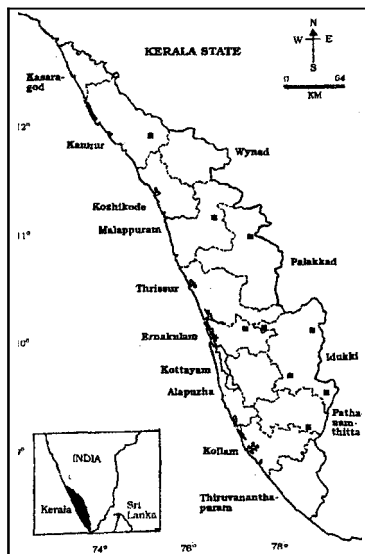
Cannanore, Malappuram, Palghat, Ernakulam, Idukki, Pathanamthitta and Quilon districts; mostly confined to hilly uplands and highlands (Map 155).

## World

India, Malesia, Polynesia, Northern Australia and China.

## Notes

In literature (RamaRao, 1914), there was confusion with regard to the identity of the 'Orila' plant used in the Ayurvedic system of medicine, forming an ingredient of the combination 'Dasamoola'. *Uraria rufescens* (DC.) Schind. was considered as the source of this medicinal product, which is identical with *Uraria hamosa* Wall. ex Wt. et Arn., as this species is enumerated by Baker (1876) and RamaRao (1914). However, in Chopra, *et al.* (1956) and Anonymous (1976), the plant which forms the source of 'Orila' product has been rightly identified as *U. lagopodioides* (L.) Desc. In fact, *U. rufescens* with which it was confused, uniformly possesses 3-foliolate leaves, whereas in *U. lagopodioides* the compound leaves are either one or three foliate.



Map 155 Distribution of *Uraria lagopodioides* (L.) Desv in Kerala

This medicinal plant of the forests of Kerala has not been included in the work of Krishnamurthy (1993).

## Products and uses

The roots of the plant is exploited on a large scale for medicinal preparations, as they form one of the 10 ingredients in the Ayurvedic combination 'Dasamoola' (10 roots). An aqueous or alcoholic extract of the plant is also used in the treatment of intermittent fever and chest inflammation. The drug is also administered in the form of leaf decoction to cure diarrhoea and it is also considered as an abortifacient. Sampson (1928) has reported that the species was tried as a green manure crop with certain amount of success.

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- Chopra, R.N., S.L. Nayar and I.C. Chopra. 1956. *Glossary of Indian Medicinal Plants*. CSIR, New Delhi. 250.

- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi.
- Rao, M. Rama, 1914. *Flowering Plants of Travancore*. Govt. Press, Trivandrum. p. 114.
- Sampson, H.C. 1928. Cover crops in tropical plantations. *Kew Bull.* 1928: 161-183.

**156. VATERIA INDICA L.**  
(**Dipterocarpaceae**)

**Nomenclature**

*Vateria indica* L., Sp. Pl. 513. 1753; Roxb., Pl. Corom. t. 288. 1820; Wt. et Arn., Prodr. 84. 1834; Wt., Ill. Ind. Bot. t. 36. 1838; Dyer in Hook. f., Fl. Brit. India 1: 313. 1874; Bourd., For. Trees Trav. 37. 1908; Rama Rao, Fl. Pl. Trav. 36. 1914; Gamble, Fl. Presid. Madras 1: 85. 1915; Nicol. et al., Intrap. Hort. Malab. 102. 1988; Janardh. in Sharma et Sanjapp. (ed.) Fl. India 3: 245-246. 1993; Krishnam., Min. For. Prod. India 285, 311-312, 339. 1993.

*Vateria malabarica* Bl., Mus. Bot. Lugd.-Bat. 2: 29. 1856; Bedd., Fl. Sylvat. South. Indiat. 84. 1871.

**Local name(s)**

Payin, Perum-payin, Vella-kunthirikkam, Vella-payin.

**Description**

Evergreen **trees**, upto 25 m high; **bark** smooth, white or grey; **branchlets** hoary-stellate pubescent. **Leaves** simple, alternate, 10-18 x 5-8.5 cm, oblong or elliptic oblong, entire, glabrous, rounded or cordate at base, obtuse or minutely acuminate at apex with 14 pairs of lateral nerves, depressed above and prominent beneath; **petioles** 2-3 cm long, stout. **Flowers** white, fragrant, pedicellate, in upto 20 cm long terminal or lateral corymbose panicles; **pedicels** upto 1.5 cm long, stout; **calyx** almost 1 cm long with 5 lanceolate lobes, hoary-pubescent on both sides and obtuse at apex; **corolla** with 5, almost 1 cm long, white, elliptic-oblong, obtuse spreading, petals; **stamens**, yellowish, 40-50, with short filaments and anthers almost sessile, glabrous and hairy at base with appendages of the connectives as long as the thecae; **pistil** with ovate-



Fig 49 *Vateria indica* L.

oblong, pubescent ovary, filiform, glabrous style and minute, entire or obscurely lobed stigma. **Capsules** pale brown, 3-valved, upto 10x 5.5 cm, ovoid-ellipsoid or oblong, obtuse; **seeds** one in each fruit (Fig. 49).

### Ecology

Dominant trees, commonly distributed in the evergreen and semi-evergreen forests and rarely in moist deciduous areas, mostly along the sides of hill streams, river banks, valleys and forest depressions. When moisture conditions are better, the trees often form almost pure patches also. Flowers mostly during February to April and fruits mature by July-August. During April-May the tree bears bright red new foliage making them conspicuous in the forests.

### Distribution

#### Kerala

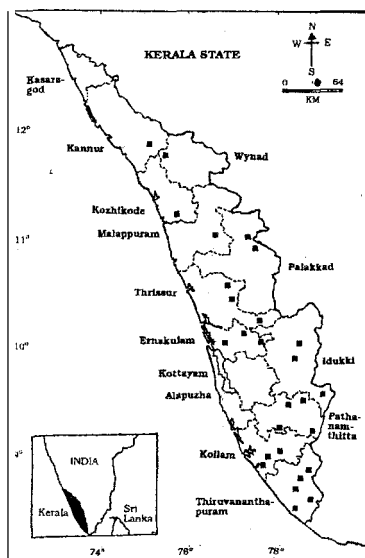
Cannanore, Wynad, Calicut, Malappuram, Palghat, Trichur, Ernakulam, Idukki, Pathanamthitta, Quilon and Trivandrum districts; almost throughout the State (Map 156).

#### World

India, Sri Lanka.

### Products and uses

The major non-timber product that the tree yields is an oleo-resin called White Dammar. It is extracted either by wounding the bark towards the beginning of dry season (the resin start oozing within 3-4 months) or by putting fire around the base of the main trunk, thereby scorching and splitting the bark open, which promote exudation of the resin. The resin is collected as compact, pincy, hard lumps of varying shapes. It possesses balsamic odour and light yellow colour or sometimes dark coloured when the trees are older. The resin is a complex mixture of triterpene hydrocarbons, ketones, alcohols and acids along with small amounts of sesquiterpenes. The resin readily dissolves in turpentine and is used in the manufacture of varnishes, for making candles or as a substitute for amber. On a large scale it is used in the manufacture of incense. Medicinally, the resin is reported to be a tonic, carminative and expectorant. It is also reported to cure throat troubles, chronic bronchitis, piles, diarrhoea, rheumatism, tubercular glands, gonorrhoea and ulcers (FAO, 1985).



Map 156 Distribution of *Vateria indica* L in Kerala

Seed kernels yield the oil, Pincy Tallow (Malabar Tallow, Dhupa Tallow) by solvent extraction (boiling powdered kernels in water) which is edible after refining. The seed oil is also used for making candles, soap and for sizing cotton yarn. Medicinally, it is reported to be used as local applicant against rheumatism (Kirtikar and Basu, 1935). Seed cake is a good manure, especially for coffee plants. A glucoside berginin is also isolated from seeds. The bark of the tree is an alexipharmic, used in ayurvedic preparations. Krishnamurthy (1993) records that the fruit shell is used for tanning.

### Production and marketing

More than 1555 kg of the oleo-resin produce called White Dammar was available to the Kerala State SC & ST Federation (1998) during 1994-95 to 1996-97, as procured through its network of tribal Societies in the State. On an average, the cost of the item was around Rs. 40.00 per kg at the time of procurement by the Federation.

### Regeneration

The tree tolerates shade and is also a moisture-lover, thriving well in damp and rich soil. However, the seedlings are very sensitive to fire. Coppicing capacity of *V. indica* is very poor (Kadmabi, 1957) whereas natural regeneration is very common in the surroundings of seed-bearing trees.

For artificial regeneration of *V. indica*, ripened and dispersed fruits containing seeds can be gathered during June-July, soon after their fall. One kilogram of fruits contains about 50-60 numbers and the seeds cannot be stored for more than 3 weeks (Ghosh, 1977). Seeds germinate 80-98% (Luna, 1996) which can be sown in filled polybags, preferably with leaf-litter on the top. Germination will be completed within 3 weeks. The seedlings can be maintained in the nursery till the next planting season. The plants can also be raised by direct seed sowing and by planting of entire seedlings. However, stump planting is reported to be not very successful (Luna, 1996).

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**157. VENTILAGO MADRASPATANA GAERTN.**  
(**Rhamnaceae**)

**Nomenclature**

*Ventilago madraspatana* Gaertn., Fruct. 1: 223. t. 49. fig. 2. 1788; Wt., Ic. Pl. Ind. Orient. 1: t. 163. 1839; Laws. in Hook. f., Fl. Brit. India 1: 630. 1875; Rama Rao, Fl. Pl. Trav. 86. 1914; Gamble, Fl. Presid. Madras 1: 217. 1918; Backer, Blumea 5: 519. 1945; Ban. et Mukh., Indian For. 9 0 207-208. 1970; Krishnam., Min. For. Prod. India 237, 363. 1993.

**Local name(s)**

Vembadam, Vembadam-patta, Sural.

**Description**

Woody **climbers**, upto 6 m high; **bark** vertically cracked, reddish inside; **branchlets** pale grey, puberulous or glabrous. **Leaves** simple, alternate, upto 9.5 x 3 cm, ovate or oblong-lanceolate, crenate or subentire, glabrous above, glabrous or puberulous beneath, obtuse at base, acuminate or subobtuse at apex; **petioles** upto 1 cm long, glabrous. **Flowers** yellowish in fascicles forming greyish pubescent panicles; **calyx** 5-lobed, basally connate, with lobes almost 0.1 cm long, triangular, acute and incurved at apex; **corolla** with 5 petals, upto 0.1 cm long, truncate and obcordate at apex; **stamens** 5, upto 0.1 cm long with oval anthers and apiculate, curved connectives; **pistil** with ovary sunken in the disc and 2 divergent style arms less than 0.1 cm long, hairy at base. **Fruits** samaroid, winged with wings upto 4 x 0.8 cm, elliptic-oblong, mucronate at tip, one seeded.

**Ecology**

Mostly confined to the dry deciduous forest tracts of the State, on the eastern side of the Western Ghats, even though the species has also been collected from the dry forests of Cannanore and Wynad districts. Flowers and

fruits are borne during the off-monsoon season from November to April.

**Distribution**

**Kerala**

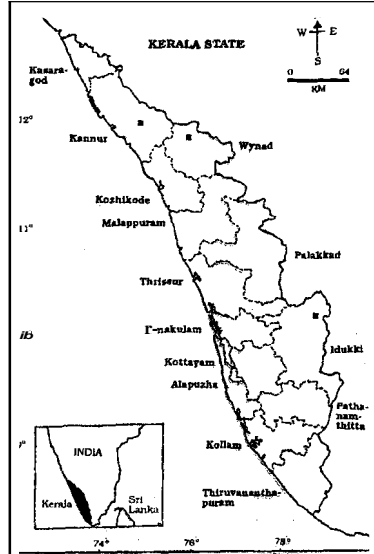
Cannanore, Wynad and Marayur and Chinnar in the Devikolam Taluk of Idukki District; mostly confined to highlands (Map 157).

**World**

Peninsular India, Sri Lanka, Myanmar, Java.

**Notes**

Banerjee and Mukherjee (1970) had given details on the orthography of the specific epithet of the species and also details of its restricted distribution in India (Peninsular India) as against reports of occurrence of the species in the eastern part of the country.



Map 157. Distribution of *Ventilago madraspatana* Gaertn in Kerala

**Products and uses**

Root bark of the plant is the source of a red dye called *ventilagin*, used for colouring mordanted cotton, wool and tasar silk. The dye can also be transformed into several other fast colours (Anonymous, 1976). The bark is collected as dark-red or brown chips or shavings. The bark also contains a fibre, used as cordage.

The root-bark of the plant is also medicinal as stomachic, tonic and stimulant and is also remedial for skin diseases. The seeds are edible after cooking. They also contain an edible oil. Krishnamurthy (1993) had noted that the leaves of the plant are also edible. The scandent stem of the plant is used as ropes, especially by the fishermen (Rama Rao, 1914).

**References cited**

Anonymous, 1976. *The Wealth of India: Raw Materials*. vol. 10. CSIR, New Delhi. p. 442.

Banerjee, S.P. and P.K. Mukherjee 1970. Studies in Rhamnaceae III. A taxonomic revision of Indian Ventilagineae. *Indian For.* 90:203-217.

Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi. p. 238.

Rao, M. Rama 1914. *Flowering Plants of Travancore*. Govt. Press, Trivandrum. p. 86.

**158. VETIVERIA ZIZANIOIDES (L.) NASH.**  
**(Poaceae)**

**Nomenclature**

*Vetiveria zizanioides* (L.) Nash. in Small, Fl. S.E. U.S. 67. 1903; Fisch. in Gamble, Fl. Presid. Madras 3: 1733. 1934; Bor, Grass. Burma, Ceylon, Ind. Pakis. 258. 1960; Nicol. *et al.*, Intrap. Hort. Malab. 314. 1988; Sreek. *et Nair*, Fl. Kerala: Grass. 203. 1991; Krishnam., Min. For. Prod. India 8, 104, 109, 145, 484, 493. 1993.

*Phalaris zizanioides* L., Mant. Pl. 183. 1771.

*Andropogon muricatus* Retz., Obs. 3: 43. 1783; Rama Rao, Fl. Pl. Trav. 441. 1914.

*Andropogon squarrosus* auct. (*non* L.f. 1781); Hook.f. in Hook.f., Fl. Brit. India 7: 186. 1896.

**Local name(s)**

Ramacham.

**Description**

Perennial, rhizomatous **herbs**, 1-2m high; **culms** densely tufted, erect, leafy, stout. **Leaves** sheathed, ligulate, upto 70 x 1 cm, linear-lanceolate, often conduplicate, glaucous, tubercled hairy or glabrous, narrowed into the sheath at base, acute at apex with prominent midrib; **ligules** annular, membranous; **sheaths** sharply keeled. **Flowers** (spikelets) in contracted, racemose, elliptic or pyramidal, terminal panicles, upto 30 cm long; **spikelets** in pairs of one pedicelled and one sessile; **sessile spikelets** bisexual, 0.3-0.5 cm long, lanceolate or oblong, compressed laterally, awnless; **glumes** 2; **lower glume** upto 0.4 cm long, oblong-lanceolate, obtuse or rounded at apex with inflexed margins; **upper glume** upto 0.5 cm long, boat-shaped or lanceolate, keeled, aristate at apex; **lower lemma** upto 0.3 cm long, hyaline, ciliate, 2-nerved, empty; **upper lemma** upto 0.3 cm long, hyaline, nouched and mucronate at apex; **palea** upto 0.2 cm long, oblong, membranous; **stamens** 3 with anthers upto 0.2 cm long; **pistil** with elliptic ovary, upto 0.1 cm long style and about 0.1 cm long stigma.

**Ecology**

Tall grasses, often cultivated both in the hills and also the plains, running wild in moist deciduous forests, especially in the openings and along river sides. Flowers and fruits during July to December.



## Distribution

### Kerala

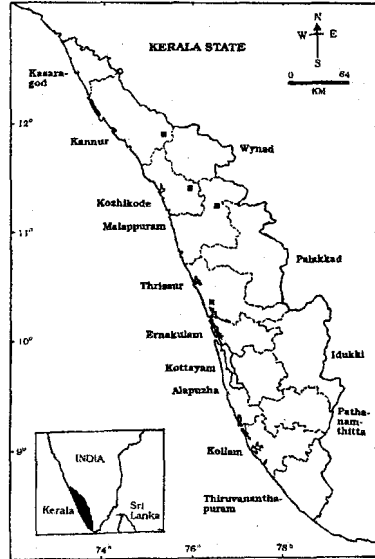
Cannanore, Calicut, Malappuram and Trichur districts; mainly in the to low and midlands (Map 158).

### World

India, Sri Lanka, Myanmar, South-East Asia to tropical Africa.

## Products and uses

From the aromatic roots of this grass, vetiver oil is extracted for use in perfume and cosmetic industry. The oil is extracted by water distillation process and subsequent refinements by fractional filtration and dehydration. The quality of the oil depends on the habitat (wild/cultivated), age of the plant, length of distillation period, storage period, etc. The roots are also dried and made into mats, window curtains, screens, baskets, hand-fans, etc.



Map 158. Distribution of *Vetiveria zizanioides* (L.) Nash in Kerala.

Medicinally, vetiver oil is known to be a carminative, colic, obstinate, stimulant, diaphoretic and refrigerant (Anonymous, 1976). Roots of vetiver grass is made into a paste and used to cure swellings by local people (Krishnamurthy, 1993).

It has also been reported that the grass yields a chemical pulp with high cellulose content useful for making printing and writing papers. Being short-fibred it has to be used along with 30-40% of long-fibred pulp.

## Production and marketing

Dried roots of the plant yield the Vetiver oil of commerce which is in great demand both in India and abroad. On an average, about 4000-5000 kg of fresh roots will be available from one hectare plantation of the species in South India (Anonymous, 1976). The oil yield is about 0.1 to 0.3% in root samples from North India, whereas it is 0.62-0.79% for the samples collected from southern parts of the country.

The Vetiver roots production and its utilization for making various heat resisting items was quite common in Kerala during the first half of the century. But, after 1950s, both the activities diminished and at present only very little

of the item is collected and marketed from the State. This is very evident from the data sources of the Kerala State SC & ST Federation (1998), who received only about 19kg of the roots during 1994-95 to 1996-97. However, in the northern parts of India, the product was gathered and marketed on a large scale and during 1980-81, about 0.11 tonnes of Vetiver oil was also exported from the country (Shiva, *et al.*, 1996).

### Regeneration

Slips separated from the clumps of harvested plants of the preceding crop with intact rhizomes and 15-20cm long shoot portion or seedlings raised in the nursery can be used for multiplying the plant. For raising seedlings, seeds are usually sown during January (Anonymous, 1976) and seedlings will be ready for outplanting by the onset of monsoon in June. However, propagation by seeds is not a very usual practice for the species. For planting, there are three different methods, and in the first method, conical ridges, 30-38 cm high and 48 cm apart, are prepared and slips planted 23 cm apart, on the top of the ridges (Anonymous, 1976). In another method, beds 30 cm high, 50 cm wide and 30 cm apart from edge to edge are taken and slips planted in rows, 22 cm apart and 22 cm on either side. In the third system, beds 45 cm high, 50 cm wide and 30 cm apart from edge to edge, are taken and two rows of slips planted 30 cm apart, leaving 15 cm on either side. Of these, the second method is more commonly used. In any case, the slips may be planted in pits, 5-8 cm deep, made by a pointed stick. Two or three slips are usually planted in each pit to provide for casualties, if any, and also for the formation of a thick stand. The soil around the slips has to be firmly pressed after planting and the beds levelled. In one hectare, about 1.5 to 2.25 lakhs of the slips can be planted.

### References cited

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- Kerala State SC & ST Federation 1998. Different items of LFPP handled during 1994-95 to 1996-97 and price fixed by MFP Committee per kilogram for 1997-98. Trivandrum (unpublished).
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- Shiva, M.P., S. Aswal, A. Sharma, P. Mathur and R. Chandra 1996. *Trends of Export and Import of the Minor Forest Products in India*. Centre for Minor Forest Products, Dehra Dun. 38 p.

**159. ZANTHOXYLUM RHETSA (ROXB.) DC.  
( Rutaceae )**

**Nomenclature**

*Zanthoxylum rhetsa* (Roxb.) DC., Prodr. 1: 728. 1824; Wt. et Arn., Prodr. 148. 1834; Bedd., Fl. Sylvat. South. India 41. t. 6. 1871; Hook. f. in Hook. f., Fl. Brit. India 1: 495. 1875; Bourd., For. Trees Trav. 57. 1908; Rama Rao, Fl. P1. Trav. 61. 1914; Gamble, Fl. Presid. Madras 1: 150. 1915; Hartl., J. Arn. Arbor. 51: 424. 1970; Babu, Bull. bot. Surv. India 16: 56. 1977; Nicol. *et al.*, Intrap. Hort. Malab. 234. 1988; Krishnam., Min. For. Prod. India 457. 1993.

*Fagara rhetsa* Roxb., Fl. Indica 1: 438. 1820.

*Fagara budrunga* Roxb., Fl. Indica 1: 437. 1820; Krishnam., Min. For. Prod. India 134, 158, 508. 1993.

*Zanthoxylum budrunga* (Roxb.) DC., Prodr. 1: 728. 1824; Hook. f. in Hook. f., Fl. Brit. India 1: 495. 1875; Gamble, Fl. Presid. Madras 1: 106. 1915.

*Zanthoxylum limonella* (Dennst.) Alston in Trimen, Handb. Fl. Ceylon Suppl. 6: 37. 1931; (*nom. invalid*); Hartl., J. Arn. Arbor. 47: 197. 1966.

**Local name(s)**

Kattu-murikku, Mullilam.

**Description**

**Trees**, upto 30 m high, armed with conical spines upto 0.5 cm broad at base; **branchlets** terete, often tortuous and hollow or septate inside, scattered spiny. **Leaves** crowded towards apex of branchlets, imparipinnate, upto 55 cm long, mostly unarmed or with scattered prickles; **leaflets** 4-6 pairs, opposite or subopposite on the terete or slightly grooved rhachis, 6-13 x 3-5.5 cm, ovate-oblong or oblong-lanceolate, subcoriaceous, entire or remotely crenate, glabrous, acute, cuneate or oblique at base, caudate-acuminate at apex; **petiolules** 0.3-0.6 cm long, glabrous. **Flowers** yellow, polygamous, in terminal or axillary corymbose panicles, upto 20 cm long and often prickly; **calyx** 3-8 fid, lobes minute, triangular; **corolla** with 4 valvate, elliptic petals, upto 0.1 cm long; **stamens** 4, upto 0.3 cm long, with short filaments and yellow anthers; **pistil** with solitary carpel, acentric style and capitate stigma. **Follicles** upto 1 cm across, globose, apiculate at apex with persistent style base; **seeds** bluish-black, subglobose, smooth.

**Ecology**

Common at low altitudes in the deciduous forests and disturbed areas. Flowers produced during September to November and fruits by December to January.

## Distribution

### Kerala

Kasaragod, Cannanore, Wynad, Calicut, Malappuram, Trichur, Ernakulam and Idukki districts; more common in the midlands and hilly uplands (Map 159).

### World

India, Sri Lanka, Myanmar, Sikkim, Thailand, South Vietnam, Malay Peninsula, Java, Philippines, Moluccas, southern Papua.

### Notes

Babu (1977) had given a detailed discussion on the identity and nomenclature of the species.

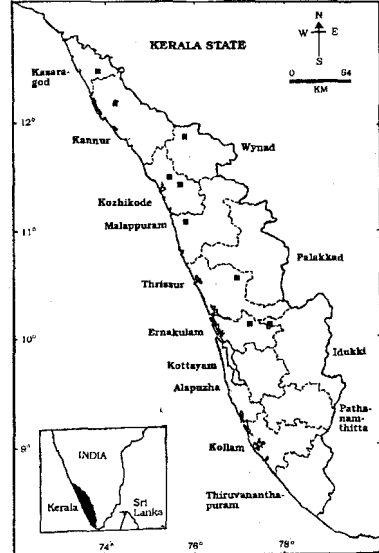
### Products and uses

Fruits of this tree are medicinal against rheumatism and the essential oil extracted from seeds is used in the treatment of cholera. The unripe carpels and seeds are also used as condiment. The root bark is a purgative and fruits are astringent and stimulant. Babu (1990) reports that due to the resemblance of the dried fruits of this species, it is often used for adulterating black pepper.

The spines which get detached from the bark is also made into beads, necklaces, buttons, etc. by local people (Krishnamurthy, 1993) and they also believe that handstick made of this tree when used will give strength and vitality. The wood is also used for shuttles and picking sticks and in textile industry.

### Production and marketing

The dried seeds of tree is the item gathered and marketed by the Kerala State SC & ST Federation (1998) as a non-wood forest produce received from its network of collection centres in the State. During 1994-95 to 1996-97, the price fixed for the product was Rs. 6.65 for procurement and Rs. 7.00 for sale and the exact quantity of the item that the Federation handled during the period is not available.



Map 159. Distribution of *Zanthoxylum rhetsa* (Roxb.) DC. in Kerala.

## Regeneration

The tree regenerates fairly well in natural conditions where there is availability of ample light. Clearing the undergrowth around mother trees and weeding around young seedlings can also improve the natural regeneration of the species.

During rainy season and immediately after, ripened fruits can be collected, either from mother trees or as they fall on the ground. For artificial regeneration, planting of 5-7 months old nursery-raised seedlings or direct sowing of seeds are reported to be successful (FRI, 1981). However, Kadambi and Dabral(1955) had noted that direct sowing of seeds is better than outplanting nursery raised seedlings. The tree can be raised in poor soil and also in plantations, especially of teak. During the first two years, growth of the seedlings is rather slow and with in 4-5 years, they attain a height of about 4-5 metres.

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- FRI, 1981. *Troup's Silviculture of Indian Trees*. vol. 3. Controller of Publications, Delhi. pp. 99-101.
- Kadambi, K. and S.N. Dabral 1955. Studies on the suitability of different methods of artificially regenerating forest trees. *Indian For.* 81: 129-151.
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- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi. p. 457.

## 160. ZINGIBER ZERUMBET (L.) ROSC, EX SMITH (Zingiberaceae)

### Nomenclature

*Zingiber zerumbet* (L.) Rosc. ex Smith, Exot. Bot. 2: 105. t. 112. 1805; Wt., Ic. Pl. Ind. Orient. t. 2003. 1853; Baker in Hook.f., Fl. Brit. India 6: 247. 1892; Rama Rao, Fl. Pl. Trav. 402. 1914; Fisch. in Gamble, Fl. Presid. Madras 3: 1490. 1928; Burt et Smith, Notes Roy. bot. Gardn. Edinburgh 3 1: 182. 1972; Rao et Verm., Bull. bot. Surv. India 14: 137. 1972; Nicol. et al., Intrap. Hort. Malab. 319. 1988.

*Amomum zerumbet* L., Sp. Pl. 1: 1. 1753.

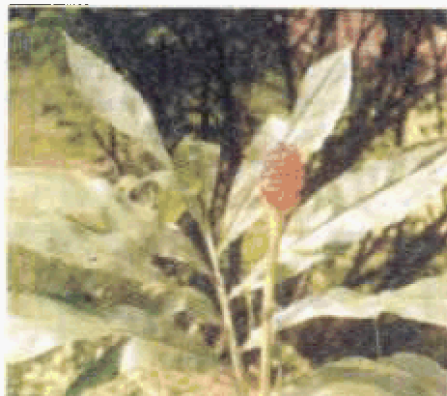
*Amomum sylvestre* Lamk., Encyl. Meth. Bot. 134. 1783 (*nom. illeg.*).

**Local name(s)**

Kattinchi, Kattu-inchi-koova, Kattu-kolinji.

**Description**

Perennial, leafy, rhizomatous **herbs**, upto 1.5 m high. **Leaves** sessile, 20-30 x 4-8 cm, oblong-lanceolate or lanceolate, pubescent below, narrowed at base, acuminate at apex; **ligules** upto 3.5 cm long, membranous, scattered hairy. **Flowers** creamy-yellow in peduncled, upto 7 cm long, ovate-oblong spikes, almost rounded at apex; **bracts** red, almost 3 x 2 cm, ovate, rounded and mucronate at apex; **calyx** 3-toothed, unilaterally split; **corolla** 3-lobed, tubular, upto 2 cm long, with the dorsal lobe upto 2.5 x 2 cm, narrowed at apex and lateral lobes still narrower; **labellum** yellow, lobed, with the middle lobe upto 2 x 2 cm, suborbicular and emarginate at apex and lateral lobes (staminodes) upto 1.5 cm long, ovate and almost free from the base upwards with beaked anthers almost 1 cm long; **pistil** with ovary upto 0.4 x 0.3 cm, glabrous with filiform style and small, subglobose stigma. **Capsules** white, almost 2 cm long, oblong; **seeds** black, upto 0.6 cm in length (Fig. 50).

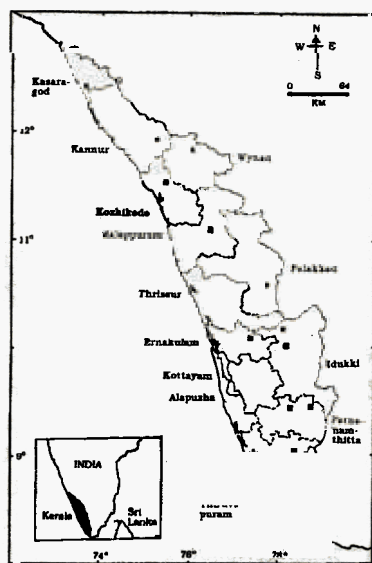
Fig. 50. *Zingiber zerumbet* (L.) Rosc. ex Smith.**Ecology**

Rare, forming part of the ground flora in evergreen and semi-evergreen forests, mostly in valleys and other wet or shaded areas. Flowers are borne during July to October.

**Distribution**

Kerala

Kasaragod, Cannanore, Wynad, Calicut, Malappuram, Palghat, Trichur, Ernakulam, Idukki, Pathanamthitta,

Map 160. Distribution of *Zingiber zerumbet* (L.) Rosc. PX Smith in Kerala.

Quilon and Trivandrum districts; almost throughout the State, mainly in the hilly uplands and highlands (Map 160).

World

India, Sri Lanka, Malesia.

**Notes**

This medicinal plant, extensively extracted from the forests of Kerala has not been included in the work of Krishnamurthy (1993).

**Products and uses**

Rhizome of the plant is extensively extracted for medicinal use. It is bitter and aromatic and is used almost for all purposes, as an alternate for ginger (*Zingiber officinale* L.). Medicinally, rhizomes are used for cough, stomach troubles, asthma, worms, leprosy and other skin diseases (Anonymous, 1976). Rhizomes which yield a fragrant oil on steam distillation are also used in perfumery, including toilet articles, etc.

**References cited**

- Anonymous, 1976. *The Wealth of India: Raw Materials*. vol. 11. CSIR, New Delhi. 105.
- Krishnamurthy, T. 1993. *Minor Forest Products of India*. Oxford & IBH, New Delhi.

## 10. PRODUCTS INDEX

Non-Wood forest produce plants of Kerala yield different categories of products. Accordingly, they are classified into medicinal plants, spices, condiments and masticatories, gums and resins, dyes, tanning materials, essential oils, detergents, cosmetics and perfumes, narcotics and beverages, fibres and floss, edible and fodder plants, fats and oils, paper and pulp, poisons and pesticides, plants used in cottage industries and plants yielding certain other specific products classified under the head 'other products'. The page numbers where they appear in the Manual are also noted against the valid names used in the index, arranged alphabetically under each product category.

### 10. 1. Medicinal plants

- |                                     |  |
|-------------------------------------|--|
| <i>Abrus precatorius</i> 26         | <i>Calamus travancoricus</i> 105                   |
| <i>Acacia nilotica</i> 28           | <i>Callicarpa tomentosa</i> 109                    |
| <i>Acacia pennata</i> 31            | <i>Calophyllum inophyllum</i> 111                  |
| <i>Acacia sinuata</i> 33            | <i>Canarium strictum</i> 114                       |
| <i>Acacia torta</i> 36              | <i>Cannabis sativa</i> ssp. <i>indica</i> 116      |
| <i>Acorus calamus</i> 38            | <i>Cassia auriculata</i> 119                       |
| <i>Adenanthera pavonina</i> 40      | <i>Cassia fistula</i> 122                          |
| <i>Adhatoda zeylanica</i> 42        | <i>Chukrasia tabularis</i> 126                     |
| <i>Aegle marmelos</i> 45            | <i>Cinnamomum malabatrum</i> 128                   |
| <i>Ailanthus triphysia</i> 47       | <i>Cinnamomum sulphuratum</i> 131                  |
| <i>Alangium salvifolium</i> 51      | <i>Cissampelos pareira</i> var. <i>hirsuta</i> 132 |
| <i>Alpinia galanga</i> 53           | <i>Cissus quadrangularis</i> 134                   |
| <i>Anamirta cocculus</i> 55         | <i>Cochlospermum religiosum</i> 136                |
| <i>Andrographis paniculata</i> 58   | <i>Coscinium fenestratum</i> 138                   |
| <i>Antiaris toxicaria</i> 60        | <i>Costus speciosus</i> 140                        |
| <i>Aphanamixis polystachya</i> 62   | <i>Crataeva nurvala</i> 142                        |
| <i>Aristolochia indica</i> 64       | <i>Croton tiglium</i> 144                          |
| <i>Asparagus racemosus</i> 66       | <i>Curculigo orchioides</i> 146                    |
| <i>Baliospermum solanifolium</i> 68 | <i>Curcuma amada</i> 147                           |
| <i>Bambusa bambos</i> 70            | <i>Curcuma aromatica</i> 149                       |
| <i>Bombax ceiba</i> 74              | <i>Curcuma zedoaria</i> 153                        |
| <i>Boswellia serrata</i> 77         | <i>Cyclea peltata</i> 156                          |
| <i>Butea monosperma</i> 81          | <i>Cymbopogon flexuosus</i> 158                    |
| <i>Caesalpinia bonduc</i> 85        | <i>Decalepis hamiltonii</i> 161                    |
| <i>Caesalpinia sappan</i> 87        | <i>Dendrocalamus strictus</i> 162                  |
| <i>Calamus latifolius</i> 97        | <i>Desmodium gangeticum</i> 165                    |
| <i>Calamus rotang</i> 101           | <i>Dioscorea pentaphylla</i> 167                   |



- Diospyros malabarica* 169  
*Dipterocarpus indicus* 172  
*Dysoxylum malabaricum* 174  
*Elettaria cardamomum* 176  
*Embelia ribes* 179  
*Entada rheedii* 181  
*Euphorbia thymifolia* 184  
*Garcinia cambogia* 185  
*Garcitiia gummi-gutta* 188  
*Gloriosa superba* 190  
*Gmelina arborea* 192  
*Gymnema sylvestre* 194  
*Helicteres isora* 196  
*Hemidesmus indicus* 198  
*Heracleum ringens* 200  
*Indigofera tinctoria* 213  
*Holarrhena pubescens* 202  
*Holostemma annulare* 204  
*Hydnocarpus pentandrus* 208  
*Ichnocarpus frutescens* 211  
*Ipomea mauritiana* 216  
*Kaempferia galanga* 218  
*Kingiodendron pinnatum* 220  
*Kydia calycina* 222  
*Limonia acidissima* 225  
*Madhuca neriifolia* 227  
*Malaxis rheedii* 229  
*Mesua ferrea* 231  
*Mimusops elengi* 234  
*Mucuna pruriens* 237  
*Myristica malabarica* 239  
*Nervilia aragoana* 240  
*Nilgirianthus ciliatus* 242  
*Oroxylum indicum* 259  
*Persea macrantha* 263  
*Phyllanthus emblica* 265  
*Piper longum* 268  
*Piper nigrum* 270  
*Plumbago zeylanica* 272  
*Pongamia pinnata* 274  
*Pseudarthria viscida* 277  
*Pterocarpus marsupium* 284  
*Raphidophora pertusa* 288  
*Rauvolfia serpentina* 290  
*Rotula aquatica* 292  
*Rubia cordijolia* 294  
*Samadera indica* 296  
*Santalum album* 298  
*Sapindus trijoliata* 301  
*Saraca asoca* 304  
*Sarcostemma acidum* 307  
*Sarcostigma kleinii* 309  
*Schleichera oleosa* 313  
*Semecarpus anacardium* 315  
*Sida acuta* 320  
*Sida cordata* 321  
*Sida cordifolia* 323  
*Sida rhombifolia* 325  
*Sida spinosa* 327  
*Solanum violaceum* 328  
*Sterculia urens* 331  
*Stereospermum colais* 336  
*Strychnos nux-vomica* 339  
*Strychnos potatorum* 342  
*Symplocos cochinchinensis* 344  
*Syzygium cumini* 346  
*Terminalia arjuna* 348  
*Terminalia bellirica* 351  
*Terminalia chebula* 353  
*Thottea siliquosa* 356  
*Tinospora cordijolia* 358  
*Toona ciliata* 360  
*Tribulus terrestris* 362  
*Trichosanthes cucumeriana* 364  
*Tylophora indica* 367  
*Uraria lagopodioides* 369  
*Vateria indica* 371  
*Ventilago madraspatana* 374  
*Vetiveria zizanioides* 376  
*Zanthoxylum rhetsa* 379  
*Zingiber zerumbet* 381

### 10. 2. Spices, condiments and masticatories

<i>Alpinia galanga</i> 53	<i>Garcinia cambogia</i> 185
<i>Callicarpa tomentosa</i> 109	<i>Kaempferia galanga</i> 218
<i>Cinnamomum malabattrum</i> 128	<i>Myristica malabarica</i> 239
<i>Curcuma aromatica</i> 149	<i>Piper longum</i> 268
<i>Decalepis hamiltonii</i> 161	<i>Piper nigrum</i> 270
<i>Elettaria cardamomum</i> 176	<i>Zanthoxylum rhetsa</i> 379

### 10. 3. Gums and resins

<i>Acacia nilotica</i> 28	<i>Garcinia gummi-gutta</i> 188
<i>Aegle marmelos</i> 45	<i>Ipomea mauritiana</i> 216
<i>Ailanthus triphysa</i> 47	<i>Kingiodendron pinnatum</i> 220
<i>Antiaris toxicaria</i> 60	<i>Kydia calycina</i> 222
<i>Bombax ceiba</i> 74	<i>Limonia acidissima</i> 225
<i>Boswellia serrata</i> 77	<i>Mesua ferrea</i> 231
<i>Butea monosperma</i> 81	<i>Mimusops elengi</i> 234
<i>Caesalpinia sappan</i> 87	<i>Palaquium ellipticum</i> 261
<i>Canarium strictum</i> 114	<i>Pterocarpus marsupium</i> 284
<i>Chukrasia tabularis</i> 126	<i>Sarcostemma acidum</i> 307
<i>Cochlospermum religiosum</i> 136	<i>Semecarpus anacardium</i> 315
<i>Diospyros malabarica</i> 169	<i>Sterculia urens</i> 331
<i>Dipterocarpus indicus</i> 172	<i>Terminalia bellirica</i> 351
<i>Garcinia cambogia</i> 185	<i>Vateria indica</i> 371

### 10. 4. Dyes

<i>Acacia nilotica</i> 28	<i>Mimusops elengi</i> 234
<i>Acacia sinuata</i> 33	<i>Oroxylum indicum</i> 259
<i>Adenantha pavonina</i> 40	<i>Phyllanthus emblica</i> 265
<i>Adhatoda zeylanica</i> 42	<i>Pterocarpus marsupium</i> 284
<i>Aegle marmelos</i> 45	<i>Rubia cordifolia</i> 294
<i>Ailanthus triphysa</i> 47	<i>Sapindus trifoliata</i> 301
<i>Butea monosperma</i> 81	<i>Semecarpus anacardium</i> 315
<i>Caesalpinia sappan</i> 87	<i>Sterculia urens</i> 331
<i>Calophyllum inophyllum</i> 111	<i>Symplocos cochinchinensis</i> 344
<i>Cassia fistula</i> 122	<i>Syzigium cumini</i> 346
<i>Diospyros malabarica</i> 169	<i>Terminalia arjuna</i> 348
<i>Garcinia gummi-gutta</i> 188	<i>Terminalia chebula</i> 353
<i>Holarrhena pubescens</i> 202	<i>Toona ciliata</i> 360
<i>Limonia acidissima</i> 225	<i>Ventilago madraspatana</i>
<i>Mesua ferrea</i> 231	

**10. 5. Tanning materials**

- |                                 |                                 |
|---------------------------------|---------------------------------|
| <i>Acacia pennata</i> 31        | <i>Phyllanthus emblica</i> 265  |
| <i>Acacia sinuata</i> 33        | <i>Pongamia pinnata</i> 274     |
| <i>Caesalpinia sappan</i> 87    | <i>Sterculia urens</i> 331      |
| <i>Cassia auriculata</i> 119    | <i>Terminalia arjuna</i> 348    |
| <i>Cassia fistula</i> 122       | <i>Terminalia bellirica</i> 351 |
| <i>Diospyros malabarica</i> 169 | <i>Terminalia chebula</i> 353   |
| <i>Hopea parviflora</i> 206     | <i>Vateria indica</i> 371       |
| <i>Oroxylum indicum</i> 259     |                                 |

**10. 6. Essential oils**

- |                                   |                                   |
|-----------------------------------|-----------------------------------|
| <i>Acorus calamus</i> 38          | <i>Decalepis hamiltonii</i> 161   |
| <i>Adhatoda zeylanica</i> 42      | <i>Elettaria cardamomum</i> 176   |
| <i>Aegle marmelos</i> 45          | <i>Euphorbia thymifolia</i> 184   |
| <i>Alpinia galanga</i> 53         | <i>Kingiodendron pinnatum</i> 220 |
| <i>Caesalpinia bonduc</i> 85      | <i>Mimusops elengi</i> 234        |
| <i>Cinnamomum malabathrum</i> 128 | <i>Santalum album</i> 298         |
| <i>Curcuma amada</i> 147          | <i>Shorea roxburghii</i> 318      |
| <i>Curcuma zedoaria</i> 153       | <i>Vativeria zizanioides</i> 376  |
| <i>Cymbopogon flexuosus</i> 158   | <i>Zingiber zerumbet</i> 381      |

**10. 7. Detergents, cosmetics and perfumes**

- |                                  |                                   |
|----------------------------------|-----------------------------------|
| <i>Acacia sinuata</i> 33         | <i>Kingiodendron pinnatum</i> 220 |
| <i>Adenantha pavonina</i> 40     | <i>Mesua ferrea</i> 231           |
| <i>Coscinium fenestratum</i> 138 | <i>Mimusops elengi</i> 234        |
| <i>Curcuma aromatica</i> 149     | <i>Phyllanthus emblica</i> 265    |
| <i>Curcuma zedoaria</i> 153      | <i>Sapindus trifoliata</i> 301    |
| <i>Cymbopogon flexuosus</i> 158  | <i>Sterculia urens</i> 331        |
| <i>Entada rheedii</i> 181        | <i>Strychnos nux-vomica</i> 339   |
| <i>Kaempferia galanga</i> 218    | <i>Terminalia arjuna</i> 348      |
|                                  | <i>Zingiber zerumbet</i> 381      |

**10. 8. Narcotics and beverages**

- |   |                                 |
|---|---------------------------------|
| <i>Aegle marmelos</i> 45                      | <i>Entada rheedii</i> 181       |
| <i>Anamirta cocculus</i> 55                   | <i>Piper nigrum</i> 270         |
| <i>Cannabis sativa</i> ssp. <i>indica</i> 116 | <i>Syzygium cumini</i> 346      |
| <i>Curcuma zedoaria</i> 153                   | <i>Terminalia bellirica</i> 351 |
| <i>Cyclea peltata</i> 156                     |                                 |

**10. 9. Fibres and floss**

<i>Antiaris toxicaria</i> 60	<i>Holarrhena pubescens</i> 202
<i>Bombax ceiba</i> 74	<i>Kydia calycina</i> 222
<i>Butea monosperma</i> 81	<i>Sida acuta</i> 320
<i>Cannabis sativa</i> ssp. <i>indica</i> 116	<i>Sida rhombifolia</i> 325
<i>Cissampelos pareira</i> var. <i>hirsuta</i> 132	<i>Sterculia urens</i> 331
<i>Cochlospermum religiosum</i> 136	<i>Sterculia villosa</i> 334
<i>Helicteres isora</i> 196	<i>Tylophora indica</i> 367
<i>Hemidesmus indicus</i> 198	

**10. 10. Edible and fodder plants**

<i>Acacia nilotica</i> 28	<i>Limonia acidissima</i> 225
<i>Acacia sinuata</i> 33	<i>Madhuca neriifolia</i> 227
<i>Aegle marmelos</i> 45	<i>Mesua ferrea</i> 231
<i>Ailanthus triphysa</i> 47	<i>Mimusops elengi</i> 234
<i>Asparagus racemosus</i> 66	<i>Nathapodytes nimmoniana</i> 244
<i>Bambusa bambos</i> 70	<i>Ochlandra ebracteata</i> 248
<i>Bombax ceiba</i> 74	<i>Ochlandra wightii</i> 257
<i>Cissus quadrangularis</i> 134	<i>Oroxylum indicum</i> 259
<i>Cochlospermum religiosum</i> 136	<i>Phyllanthus emblica</i> 265
<i>Costus speciosus</i> 140	<i>Piper longum</i> 268
<i>Curculigo orchioides</i> 146	<i>Piper nigrum</i> 270
<i>Curcuma neilgherrensis</i> 151	<i>Pterocarpus marsupium</i> 284
<i>Cymbopogon flexuosus</i> 158	<i>Santalum album</i> 298
<i>Decalepis hamiltonii</i> 161	<i>Sarcostigma kleinii</i> 309
<i>Dendrocalamus strictus</i> 162	<i>Schleichera oleosa</i> 313
<i>Dioscorea pentaphylla</i> 167	<i>Semecarpus anacardium</i> 315
<i>Diospyros malabarica</i> 169	<i>Sida cordata</i> 321
<i>Entada rheedii</i> 181	<i>Solanum violaceum</i> 328
<i>Garcinia cambogia</i> 185	<i>Sterculia urens</i> 331
<i>Garcinia gummi-gutta</i> 188	<i>Sterculia villosa</i> 334
<i>Gmelina arborea</i> 192	<i>Stereospermum colais</i> 336
<i>Holostemma annulare</i> 204	<i>Strychnos potatorum</i> 342
<i>Indocalamus wightianus</i> 215	<i>Syzygium cumini</i> 346
<i>Ipomoea mauritiana</i> 216	<i>Terminalia chebula</i> 353
<i>Kingiodendron pinnatum</i> 220	<i>Ventilago madraspatana</i> 374

**10. 11. Fats and oils**

<i>Abrus precatorius</i> 26	<i>Ailanthus triphysa</i> 47
<i>Adenanthera pavonina</i> 40	<i>Alangium salvifolium</i> 51

- Aphanamixis polystachya* 62  
*Baliospermum solanifolium* 68  
*Bombax ceiba* 74  
*Butea monosperma* 81  
*Caesalpinia bonduc* 85  
*Calophyllum inophyllum* 111  
*Cannabis sativa* ssp. *indica* 116  
*Cochlospermum religiosum* 136  
*Garcinia cambogia* 185  
*Hydnocarpus pentandrus* 208  
*Kingiodendron pinnatum* 220  
*Mesua ferrea* 231  
*Mimusops elengi* 234  
*Myristica malabarica* 239  
*Nothapodytes nimmoniana* 244  
*Palaquim ellipticum* 261  
*Pongamia pinnata* 274  
*Santalum album* 298  
*Sapindus trifoliata* 301  
*Sarcostigma kleinii* 309  
*Schleichera oleosa* 313  
*Semecarpus anacardium* 315  
*Sterculia urens* 331  
*Terminalia bellirica* 351  
*Terminalia chebula* 353  
*Toona ciliata* 360  
*Vateria indica* 371  
*Ventilago madraspatana* 374

### 10. 12. Paper and pulp

- Acacia nilotica* 28  
*Aegle marmelos* 45  
*Bambusa bambos* 70  
*Butea monosperma* 81  
*Cochlospermum religiosum* 136  
*Dendrocalamus strictus* 162  
*Gmelina arboreu* 192  
*Helicteres isora* 196  
*Holostemma annulare* 204  
*Ochlandra ebracteata* 248  
*Ochlandra scriptoria* 250  
*Ochlandra travancorica* 254  
*Ochlandra wightii* 257  
*Pongamia pinnata* 274  
*Pterocarpus marsupium* 284  
*Schleichera oleosa* 313  
*Sterculia urens* 331  
*Vateria indica* 371

### 10. 13. Poisons and pesticides

- Acacia pennata* 31  
*Acacia sinuata* 33  
*Acorus calamus* 38  
*Adhatoda zeylanica* 42  
*Alpinia galanga* 53  
*Anamirta cocculus* 55  
*Antiaris toxicaria* 60  
*Aphanamixis polystachya* 62  
*Entada rheedii* 181  
*Hydnocarpus pentandrus* 208  
*Piper longum* 268  
*Pongamia pinnata* 274  
*Sumandera indica* 296  
*Santalum album* 298  
*Sapindus trifoliata* 301  
*Sarcostemma acidum* 307  
*Schleichera oleosa* 313  
*Semicarpus anacardium* 315  
*Strychnos nux-vomica* 339

**10. 14. Cottage industries**

<i>Bambusa bambos</i> 70	<i>Indocalamus wightianus</i> 215
<i>Calamus brandisii</i> 89	<i>Ochlandra beddomei</i> 246
<i>Calamus dransfieldii</i> 91	<i>Ochlandra ebracteata</i> 248
<i>Calamus gamblei</i> 93	<i>Ochlandra scriptoria</i> 250
<i>Calamus hookerianus</i> 95	<i>Ochlandra sivagiriana</i> 252
<i>Calamus latifolius</i> 97	<i>Ochlandra travancorica</i> 254
<i>Calamus pseudotenuis</i> 99	<i>Ochlandra wightii</i> 115, 116, 251
<i>Calamus rotang</i> 101	<i>Pseudoxytenanthera bourdillonii</i> 279
<i>Calamus thwaitesii</i> 103	<i>Pseudoxytenanthera monadelphica</i> 280
<i>Calamus travancoricus</i> 105	<i>Pseudoxytenanthera ritcheyi</i> 282
<i>Calamus vattayila</i> 42, 107	<i>Santalum album</i> 296
<i>Chimonobambusa densifolia</i> 125	<i>Schizostachyum beddomei</i> 311
<i>Dendrocalamus strictus</i> 162	<i>Sida acuta</i> 320
<i>Hemidesmus indicus</i> 198	<i>Vetiveria zizanioides</i> 376

**10. 15. Other products**

<i>Abrus precatorius</i> 26	<i>Cinnamomum malabattrum</i> 128
<i>Acacia nilotica</i> 28	<i>Cissus quadrangularis</i> 134
<i>Adenanthera pavonina</i> 40	<i>Cochlospermum religiosum</i> 136
<i>Aegle marmelos</i> 45	<i>Cymbopogon flexuosus</i> 158
<i>Anamirta cocculus</i> 55	<i>Dendrocalamus strictus</i> 162
<i>Asparagus racemosus</i> 66	<i>Diospyros malabarica</i> 169
<i>Bambusa bambos</i> 70	<i>Entada rheedii</i> 181
<i>Bombax ceiba</i> 14	<i>Garcinia cambogia</i> 185
<i>Caesalpinia bonduc</i> 85	<i>Gloriosa superba</i> 190
<i>Calamus latifolius</i> 97	<i>Ichnocarpus frutescens</i> 211
<i>Calamus rotang</i> 101	<i>Kydia calycina</i> 222

## 11. GLOSSARY OF MEDICAL TERMS

- Abortifacient* : Agent that causes abortion
- Acene* : Pimple like eruption of skin
- Alexiteric* : Protective against infectious diseases
- Alopecia* : Disease causing baldness
- Alterative* : That corrects malfunctioning of body or metabolism
- Amenorrhoea* : Failure of mensuration
- Analgesic* : Agent that allays pain
- Anaemia* : Blood deficiency
- Anasarca* : Diffused dropsy in the skin and subcutaneous tissue
- Angina pectoris* : Heart disease marked by severe pain
- Anodyne* : Medicine that allays pain
- Antacid* : Drug that neutralises acidity
- Anthelmintic* : Destroying or expelling worms
- Antihydrotic* : Drug that checks sweating
- Antilithic* : Drug against stone or calculus
- Antiperiodic* : Preventing regular recurrence of a disease
- Antiphlogistic* : Medicine to check inflammation
- Antipyretic* : Preventing or relieving itching
- Antiscorbutic* : Acting against scurvey
- Antispasmodic* : Opposing spasms or convulsions
- Aperient* : Mild purgative
- Aphthae* : Ulcer on the mucous membrane
- Apoplexy* : Stroke; sudden loss of consciousness
- Ardor urine* : Burning sensation on urination
- Aromatic* : Fragrant, spicy
- Ascaris* : Intestinal worms
- Ascites* : Abdominal dropsy
- Asthma* : Chronic bronchial disorder
- Astringent* : Having power to contract organic tissues
- Atony* : Lack of muscular power
- Attenuant* : Fluid diluting agent
- Bechic* : Remedy for cough
- Bedsores* : Ulceration on bed-ridden patients
- Beriberi* : Vitamin B1 deficiency disease
- Bilious* : Affected by or pertaining to bile
- Blenorrhoea* : Excess mucus discharge
- Bronchitis* : Inflammation of air passages
- Calculus* : Hard concretion in the body
- Cancer* : Any malignant growth
- Carbuncle* : Acute suppurative inflammation of skin and tissue
- Caries* : Teeth decay

- Carminative* : Drug curing flatulence  
*Catarrh* : Inflammation of mucous membrane  
*Cathartic* : Agent for cleansing the bowels (purgative)  
*Caustic* : Agent that destroys tissues  
*Cellulitis* : Inflammation of cellular tissues below skin  
*Chilblains* : Defective blood circulation  
*Cholagogue* : Drug which causes increased flow of bile  
*Chorea* : Involuntary actions of limbs and face  
*Chranchre* : Syphilitic ulcer  
*Chylous* : Urine with milky fluid  
*Colic* : Related to the colon  
*Congestion* : Abnormal collection of blood in any part  
*Conjunctivites* : Inflammation of eye membranes  
*Contusion* : Injury to soft parts without skin break  
*Croup* : Difficulty in breathing and hoarse cough  
*Cystitis* : Inflammation of urinary bladder  
*Dandruff* : White scales formation in the hair  
*Delirium* : Mental disturbance  
*Demulcent* : Soothing  
*Deobstruent* : Relieving or removing obstruction  
*Depilatory* : Agent that destroys hair  
*Depurative* : Purifying  
*Diabetes* : Disease related to sugar metabolism  
*Diaphoretic* : Promoting sweating  
*Diphtheria* : Throat infection  
*Discutient* : Drug dispersing tumour or coagulated fluid  
*Diuretic* : Promoting the discharge of urine  
*Dropsy* : Excess watery fluid in any part of the body tissues or cavities  
*Dysentery* : Diarrhoea and discharge of mucus and blood  
*Dysmenorrhoea* : Painful and difficult menstruation  
*Dyspepsia* : Indigestion  
*Dysuria* : Difficulty or pain in passing urine  
*Eczema* : Skin diseases, swelling, redness and lymph exudation  
*Elephantiasis* : Hypertrophy of affected parts  
*Embrocate* : To moisten and rub  
*Emetic* : Causing vomiting  
*Emmenagogue* : Agent which restores menses  
*Emollient* : Softening agent  
*Enteritis* : Inflammation of intestine  
*Epilepsy* : Nervous disorder  
*Escharotic* : Tissue destroying agent  
*Excoriation* : Removal of skin by rubbing  
*Expectorant* : Drug that removes catarrhal matter and phlegm from bronchial tissue



*Febrifuge* : Medicine which reduces fever  
*Febrile* : Related to fever  
*Fistula* : An abnormal channel  
*Flatulence* : Excessive collection of gas in stomach  
*Freckles* : Coloured spots on skin  
*Galactagogue* : Agent that promotes milk secretion  
*Gleet* : Chronic discharge of vaginal mucous  
*Glycosuria* : Excretion of sugar through urine  
*Goitre* : Enlargement of thyroid gland  
*Gonorrhoea* : Venereal disease with inflammatory discharge  
*Gravel* : Tiny stone-like particles in urinary system  
*Gripping* : Pain in bowels due to irritating substances  
*Haemoptysis* : Spitting of blood from lungs or bronchial tubes  
*Haemorrhage* : Profuse bleeding  
*Heartburn* : Burning sensation in chest and stomach due to indigestion  
*Hemicrania* : Migraine  
*Hepatitis* : Inflammation of liver  
*Hernia* : Protrusion of any organ  
*Herpes* : Vesicular eruption with neuralgic pain  
*Hydragogue* : Removing water or serum  
*Hypochondriasis* : A mental disorder  
*Hysteria* : Disease of no control on acts and feelings  
*Induration* : Spot of hardened tissue  
*Itch* : A skin disease characterised by by itching; scabies  
*Jaundice* : Liver infection and yellowish staining of tissue  
*Lactagogue* : Promoting milk secretion  
*Lactifuge* : Checking milk secretion  
*Laryngitis* : Inflammation of larynx  
*Laxative* : Agent causing loosening of bowels  
*Lithantrypic* : Drug for removal of calcium or stones  
*Leprosy* : Chronic wasting disease resulting in mutilations  
*Leucoderma* : Absence of pigment in the skin  
*Leucorrhoea* : Abnormal mucous discharge from the vagina  
*Lumbago* : Back pain in the mid or lower part of the body  
*Malaria* : Disease marked by shivering and rise in temperature.  
*Mania* : Mental disorder of over-excitement  
*Melancholla* : Mental disorder marked by depression of spirits  
*Micturition* : Tendency to urinate  
*Migraine* : Periodic headache on one side of the head  
*Narcotic* : Drug inducing deep sleep  
*Nausea* : Vomitting sensation  
*Nephritis* : Kidney inflammation  
*Neuralgia* : Nerve pain

- Ophthalmia* : Conjunctivitis  
*Orchitis* : Inflammation of testicles  
*Otitis* : Inflammation of ear  
*Otorrhoea* : Purulent discharge from ear  
*Pectoral* : Drug curing chest disorders  
*Phthisis* : Tuberculosis of the lungs  
*Pityriasis* : Scaly skin disease  
*Pneumonia* : Inflammation of lungs  
*Poultice* : A soft mesh of different substances in liquid media  
*Psoriasis* : Eruption of circumscribed, silvery scaled lesions  
*Pyorrhoea* : Disease of purulent discharge from gums  
*Refrigerent* : Drug curing feverishness  
*Rheumatism* : Pains of muscles, joints and tissues.  
*Rubifacient* : Agent that redens the skin  
*Scabies* : Itching caused by mites  
*Sedative* : Drug reducing excitement, irritation or pain  
*Soporific* : Drug inducing sleep  
*Stomatitis* : Inflammation of mouth  
*Stomachic* : Material good for the stomach  
*Strangury* : Difficulty in discharging urine  
*Styptic* : Agent that check bleeding  
*Urethritis* : Inflammation of urethra  
*Urticaria* : Allergic pain and itching of skin  
*Vermifuge* : Medicine that removes worms  
*Vesicant* : That produces blister  
*Vulnerary* : Drug that heals wound  
*Wart* : Hypertrophy or growth of skin

## 12. INDEX TO SPECIMENS EXAMINED

***Abrus precatorius* L.**

Kuthuparamba, Malabar, 22. 9. 1913, *Without coll. name* 9348 (MH); Pappinisseri, Cannanore (100m), 19. 2. 1980, *R. Ansari* 67997 (MH); Olavakkot, Palghat (75m), 17. 10. 1963, *J. Joseph* 17777 (MH); Near Guruvayur, Trichur Dist. (25m), 6. 9. 1976, *K. Ramamurthy* 47642 (MH); Near Aroor bridge, Vembanad Lake, Ernakulam, 3. 1. 1991, *M.S. Swaminathan* 95693 (MH); Thuruthy, Changanassery (20m), 16. 11. 1984, *V.T Antony* 981 (MH); Chinnar, Idukki Dist. 10. 5. 1994, *K.K.N. Nair & Mathew* 6563 (KFRI); Travancore, 29. 11. 1904, *C.A. Barber* 6704 (MH); Peppara, Trivandrum Dist. (800 m), 10. 1. 1995, *K.K.N. Nair & Mathew* 7723 (KFRI).

***Acacia nilotica* (L.) Willd. ex Delile**

Walayar Dam, outlet canal, Palghat (60m), 24-5-1964, *E. Vajravelu* 19061 (MH).

***Acacia pennata* (L.) Willd.**

Kuthuparamba farm, Malabar, 18.9. 1913, *Without coll. name* 9181 (MH); Thaliparamba farm, Malabar, March 1907, *C.A. Barber* 7879 (MH); Begur RF, Cannanore (825m), 19. 8. 1980, *KS. Ramachandran* 68256 (MH); Tolpetty RF (775m), 14. 11. 1978, *KS. Ramachandran* 58742 (MH); Begur RF, Cannanore (825m), 10. 8. 1979, *KS. Ramachandran* 62787 (MH); Roadside, way to Sultan's Battery, Calicut (900), 19. 8. 1964, *J.L. Ellis* 20485 (MH); Agali forests, Palghat (575m), 17. 10. 1965, *E. Vajravelu* 26312 (MH); Mukkali forest, Palghat (425m), 14.7. 1969, *E. Vajravelu* 32087 (MH); Malampuzha, Palghat (100m), 14.7.1963, *J. Joseph* 17147 (MH); Silent valley RF, Palghat (850m), 12. 10. 1965, *E. Vajravelu* 26179 (MH); Neriamangalam to Velara (525m), 20. 8. 1965, *K.M. Sebastine* 25083 (MH); Koruthodu, Thekkady, 8. 9. 1994, *K.K.N. Nair & Mahtew* 6598 (KFRI); Pulluparai to Peruvanthanam (525m), 22. 1. 1965, *K. Vivekananthan* 22955 (MH); Thekkadi (875m), 28.5.1965, *K. Vivekananthan* 246368 (MH); Lower Camp, Periyar (525m), 26. 12. 1974, *K. Vivekananthan* 45721 (MH); Ranni RF (300m), 29.7. 1979, *C.N. Mohanan* 63438 (MH).

***Acacia sinuata* (Lour.) Merr.**

Tirunelli, Cannanore (840m), 4. 3. 1979, *KS. Ramachandran* 62041 (MH); Begur RF, Cannanore (825m), 21. 2. 1978, *V.S. Ramachandran* 54135 (MH); Mukkali forest, Palghat (700m), 12. 1. 1979, *E. Vajravelu* 59120 (MH); Mukkali check post area (650m), 8. 11. 1976, *E. Vajravelu* 48875 (MH); Dhoni, Palghat, 21. 11. 1994, *K.K.N. Nair & Mathew* 7722 (KFRI); Nelliampathy, Palghat, 18. 11. 1994, *K.K.N. Nair & Mathew* 7717 (KFRI);

Ayyappankovil area, Nelliampathy RF, Palghat (925m), 13. 2. 1979, *E. Vajravelu* 60404 (MH).

***Acacia torta* (Roxb.) Craib**

Varalapadi, Walayar Range, Palghat, 18.9.1975, *K.N. Subramanian* 5340 (IFGTB); Walayar RF, Palghat Forest Division, 17.11.1976, *K.N. Subramanian* 6467 (IFGTB); Nelliampathy, Palghat, 8. 11. 1994, *K.K.N. Nair & Mathew* 7716 (KFRI); Moozhiar, along roadside from Rest House to Sabarigiri power station, Ranni Division, 24.2.1983, *N. Venketasubramanian* 9140 (IFGTB); Kottur RF, Trivandrum, 14. 1. 1995, *K.K.N. Nair & Mathew* 7735 (KFRI).

***Acorus calamus* L.**

Old Devikolam, (1675m), 14-6-1963, *Sebastine & Vivekananthan* 16492 (MH).

***Adenanthera pavonina* L.**

Bakel, Cannanore (175m), 21.7. 1981, *R. Ansari* 70979 (MH); Near Koratti, Trichur (25m), 16.9. 1976, *K. Ramamurthy* 48542 (MH); Thenmala, Quilon (450m), 29. 9. 1979, *C.N. Mohanan* 63073 (MH).

***Adhatoda zeylanica* Medic.**

Kumbala, Kasaragod (50m), 25. 1. 1979, *V.J.Nazr* 59886 (MH); Karimbam, Kasaragod (150m), 17.5. 1982, *V.J.Nair* 73935 (MH); Near Pazhassi dam, Cannanore, 21. 1. 1979, *V.S. Ramachandran* 59063 (MH); Calicut (sea level), 10.12.1931, *V.Narayanaswami* 6252 (MH); Olavacod (175m), Palghat, 16.10. 1963, *J. Joseph* 17744 (MH); Near Vazhani, Trichur (175m), 10.4.1977, *K. Ramamurthy* 49282 (MH); Thumburmuzhi, Trichur, 18.3. 1982, *R.Rajan* 73059 (MH); Calvery Mount, Erattayar, Idukki, 14. 10. 1982, *C.N. Mohanan* 74621 (MH); Pullupara to Peruvanthanam, Idukki Dist., 22. 1. 1965, *K. Vivekananthan* 22939 (MH); Near Neyyar dam, Trivandrum (125m), 16.4. 1973, *J. Joseph* 44175 (MH).

***Aegle marmelos* (L.) Corr.**

Chermmangalam, Palghat (150), 31. 10. 1976. *E. Vajravelu* 48796 (MH).

***Ailanthus triphysa* (Dennst.) Alston**

Nedumpoyil, Cannanore, 27. 2. 1979, *V.S. Ramachandran* 61969 (MH); Moolamattom, Idukki, 18. 2. 1982, *C.N. Mohanan* 73359 (MH); Adoor, Quilon, 18. 8. 1980, *C.N. Mohanan* 69346 (MH); Pulimath, Trivandrum, 28.2. 1974, *M. Mohanan* 59426 (MH); Travancore, Feb. 1907, *J.S. Gamble* 8607 (MH).

***Aphanamixis polystachya* (Wall.) Parker**

Ayyappan kovil, Palghat (850m), 4.3. 1975, *E. Vajravelu* 46185 (MH); Silent valley RF, Palghat (800m), 22. 12. 1969, *E. Vajravelu* 33272 (MH); Shola below Ayyappan kovil, 27. 10. 1976, *E. Vajravelu* 48727 (MH); Aruvampara slopes, (850m), 19. 1. 1980, *P. Bhargavun* 65587 (MH); Below dam site, Silent valley (850m), 10.4. 1978, *N. C. Nair* 56743 (MH); Panthanthodu, Palghat (825m), 9. 10. 1979, *N. C. Nair* 64446 (MH); Shola above Sirunelli estate, Nelliampathy, Palghat (850m), 14. 2. 1979, *E. Vujravelu* 60426 (MH); Kallar valley, Travancore (400m), 12. 10. 1928, *V. Narayanaswamy s.n.* (MH).

***Aristolochia indica* L.**

Hosdurg, Kasaragod (175m), 7. 10. 1979, *R. Ansari* 64793 (MH); Kannothe, Cannanore (150m), 21. 8. 1980, *KS. Ramachandran* 68248 (MH); Nedumpoil, Cannanore (150m), 19. 2. 1978, *KS. Ramachandran* 54071 (MH); Kuthuparamba, Malabar (75m), 19.9. 1913, *J. Joseph* 17879 (MH); Walayar dam area, Palghat (150m), 25. 10. 1963, *J. Joseph* 17845 (MH); Sappal hill, Dhoni RF, Palghat (1200m), 21. 10. 1963, *K. M. Sebastine* 20867 (MH); Kanjiar, Idukki (800m), 24. 2. 1983, *C. N. Mohanan* 77968 (MH); Near Pandalam bus stand, Pathanamthitta, 20. 7. 1988, *N. Anilkumar* 685 (MH); Pullu-parai, Peerumede, Kottayam (600m), 24. 11. 1967, *K. Vivekananthan* 29339 (MH).

***Asparagus racemosus* Willd.**

Kannothe, Malabar, 9. 12. 1913, *Without coll. name* 9522 (MH); Chernmannur, Mukkali, Palghat (525m), 14. 10. 1979, *N. C. Nair* 6463 (MH); Kulathoor, Changannassery, 14. 1. 1984, *Rev. Fr. Kadavil* 171 (MH); Kuttikkanam, Peerumede (1100m), 21. 9. 1964, *K. Vivekananthan* 2033 (MH); Ponnudi, Trivandrum (1000m), 29.7. 1978, *M. Mohanan* 56961 (MH).

***Baliospermum solanifolium* (J. Brum.) Suresh**

Tholpetty, Cannanore (825 m), 14.11.1978, *V. S. Ramachandran* 58732 (MH); Melukode, Malabar, 31.12.1919, *J. S. Gamble* 16369 (MH); Begur RF, Cannanore (800 m), 10.2.1978, *K. S. Ramachandran* 53850 (MH); Mancheri, Malappuram (100 m), 24.9.1970, *J. L. Ellis* 33537 (MH); Nedumkayam to Meenmutty, Malappuram (650 m), 13.3.1983, *N. C. Nair* 81215 (MH); Chindaki forests, Palghat (800 m), 9.11.1976, *E. Vajravelu* 48895 (MH); Panthanthodu, Palghat (825 m), 18.12.1969, *E. Vajravelu* 33124 (MH).

***Bambusa bambos* (L.) Voss**

Chadankampara, Kasaragod (250m), 15. 5. 1982, *K. J. Nair* 73905 (MH); Panathady RF, Cannanore (350m), 2. 8. 1979, *V. S. Ramachandran* 59293 (MH); Begur RF, Cannanore (825m), 9.2. 1978, *KS. Ramachandran* 53820

(MH); Pauathur, Cannanore (350m), 28. 1. 1979, *V.J.Nair* 59951 (MH); Periyaram, Cannanore (100m), 28. 6. 1980, *R. Ansari* 67868 (MH); Sultan's Battery, Calicut (900m), 11.2. 1964, *J.L. Ellis* 18680 (MH); Mukkali Forest, Palghat (200m), 25. 8. 1966, *E. Vajravelu* 27812 (MH); Bhavani river side, Palghat (550m) 9. 3. 1975, *E. Vajravelu* 46249 (MH); Pathanthode, Palghat (825m), 18. 12. 1969, *E. Vajravelu* 33125 (MH); Bothuvara, Adirappally, Trichur (125m), 13.2.1970, *B.V. Shetty* 33496 (MH); Vazhachal RF, Trichur (225m), 13.4.1997, *K. Ramamurthy* 49327 (MH); Erattayar, Idukki, 15.10.1982, *C.N. Mohanan* 74673 (MH); Kanjiar, Idukki (800m) 24.2.1983, *C. N. Mohanan* 77974 (MH); Mullakudy, Idukki (850m), 14.3.1973, *B.D. Sharma* 43848 (MH); Changanassery, Kottayam (10m), 3.4.1985, *V.T. Antony* 1150 (MH); Punalur (200m), 25.5.1978, *C.N. Mohanan* 55797 (MH); Pulimath, Trivandrum (125m), 26.3.1978, *M. Mohanan* 54788 (MH).

***Bambax ceiba* L.**

Thaliparamba, Cannanore, 17. 2. 1913, *Without coll. name* 8775 (MH); Nedumpoyil, Cannanore, 27. 2. 1979, *V.S. Ramachandran* 61982 (MH); Sultans Battery, Wynad, 9. 2. 1964, *J.L. Ellis* 18635 (MH); Chittur to Agali, Palghat Dist., 25. 2. 1979, *E. Vajravelu* 60670 (MH); Mangalam dam, Palghat Dist., 2. 3. 1975, *E. Vajravelu* 46139 (MH); Way to Moolamattam, Idukki, 18. 2. 1982, *C.N. Mohanan* 73354 (MH).

***Boswellia serrata* (Roxb.) Clebr.**

Karimutti, Chinnar, Idukki district, 1.8.1999, *K.K.N. Nnir & R. Jayakumar* 8754 (KFRI).

***Butea monosperma* (Lamk.) Taub.**

Karimbam, Kasaragod (200m), 23. 12. 1980, *R. Ansari* 70001 (MH); Begur RF Cannanore (825m), 25. 4. 1980, *V.S. Ramachandran* 66925 (MH); Parappa, Cannanore (225m), 24. 1. 1979, *V.J.Nair* 59854 (MH).

***Caesalpinia bonduc* (L.) Roxb.**

Nedumkayam, Nilambur, Malappuram (160m), 4. 8. 1970, *J.L.Ellis* 35368 (MH); Vazhachal reserve, Chalakudy, Trichur, 13.4. 1977, *K. Ramamurthy* 49324 (MH); Thekkady, Idukki (850m), 28. 9. 1972, *B.D. Sharma* 42073 (MH); Thekkady (875m), 8. 10. 1976, *K. Vivekananthan* 48622 (MH); Thekkady (875m), 29. 5. 1965, *K. Vivekananthan* 24381 (MH).

***Caesalpinia sappan* L.**

Way to Palaruvi, Quilon (650m), 7.9. 1977, *N.C. Nair* 50935 (MH); Quilon, Travancore, 24.10.1904, *C.A. Barber* 6658 (MH); Beyond Pallikandam, Peechi, Trichur 30. 5. 1996, *K.K.N. Nair* 7965 (KFRI).

***Calamus brandisii* Becc. ex Becc. et Hook. f.**

Bonacaud, Trivandrum, 11.2. 1987, *N. G. Nair* 6144 (KFRI).

***Calamus dransfieldii* Renuka**

Dhoni, Palghat, 16. 12. 1983, *C. Renuka* 2982, 2983 (KFRI); Dhoni, Palghat, 20. 10. 1987, *C. Renuka* 4030, 4031 (KFRI).

***Calamus gamblei* Becc. ex Becc. et Hook. f.**

Chandanathodu, Wynad District, 22.2. 1984, *C. Renuka* and *V.P.K.Nambiar* 3028 (KFRI); Oruvampara to Silent Valley, Palghat (850m), 12. 10. 1979, *N. C. Nair* 64536 (MH); Attappady, Palghat District, 27. 2. 1985, *C. Renuka* 3473 (KFRI); Silent valley, Palghat District, 28. 2. 1985, *C. Renuka* 3474 (KFRI); Pannithavarna-chola, Munnar, 28. 12. 1984, *C. Renuka* 3401 (KFRI); Eravikulam, Munnar, 12.2. 1985, *C. Renuka* 3444 (KFRI); Upper Vaguvarai, Devicolam, Kottayam (1825m), 25. 4. 1966, *B.V. Shetty* 27375 (MH); Old Devicolam, Kottayam (1625m), 25. 1. 1964, *K.M. Sebastine* 18474 (MH); Pampa, Kaklu, Ranni Division, 24.5. 1984, *C. Renuka* 3173 (KFRI); Arippa, Quilon, 17. 1. 1985, *C. Renuka* 3433 (KFRI); Achenkovil, Thenmala Division, 3. 1. 1986, *C. Renuka* 4007 (KFRI); Beyond Suryakanthi, Bonaccord, Trivandrum (750m), 22. 5. 1979, *M. Mohunan* 63205 (MH); Forest near Bonaccord Estate, Trivandrum (875m), 9. 10. 1973, *J. Joseph* 44647 (MH).

***Calamus hookerianus* Becc.**

Kottiyur, Wynad, 23. 2. 1984, *C. Renuka* 3030 (KFRI); Pakuthippalam, Nelliampathy, 6. 1. 1983, *C. Renuka & Muktesh* 2727 (KFRI); Karianchola, Parambikulam, 28. 1. 1983, *Muktesh* 2503 (KFRI); Peechi, Trichur, 9. 1. 1984, *C. Renuka* 3009 (KFRI); Pothupara, Kodanad, 29. 7. 1983, *Nambiar & C. Renuka* 2948 (KFRI); Way to Sabarimala, Pathanamthitta (200m), 14. 4. 1989, *N. Anilkumar* 1668 (MH); Moozhiar, Ranni Division, 23. 5. 1984, *C. Renuka* 3155 (KFRI); Chokkanpatty hills, Quilon (1300m), 23. 2. 1982, *C.N. Mohanan* 73481 (MH); Valayam, Achenkovil, 8. 2. 1993, *Nambiar & C. Renuka* 2902 (KFRI); Thalapara, Ariyankauv, 20. 4. 1983, *Nambiar & C. Renuka* 2926 (KFRI); Shendurney valley, Thenmala Division, 20. 4. 1983, *Nambiar & C. Renuka* 2929 (KFRI); Achenkovil, 21.4. 1983, *Nambiar & C. Renuka* 2930 (KFRI).

***Calamus pseudotenius* Becc. ex Becc. et Hook. f.**

Chandanathode, Cannanore (1100m), 17.4. 1966, *J.L. Ellis* 27108 (MH); Below Karasurya malai, Palghat (1250m), 29. 4. 1977, *E. Vujravelu* 49717 (MH); Muthikulam EB Coloney to Kudam, Palghat (850m), 27. 4. 1979, *E. Vajravelu* 62924 (MH); Attappady, Palghat, 27. 2. 1985, *C. Renuka* 3471, 3472 (KFRI); Nelliampathy, Nemmara Division, 15. 5. 1990, *C. Renuka* 4099 (KFRI); Parambikulam to Vazhachal, Trichur (550m), 19. 4. 1977,

*K. Ramamurthy* 49383 (MH); Vazhathope, Idukki (700m), 18.2. 1982, *VS. Raju* 71257 (MH); Kozhikkanam, Peerumedu, 24. 11. 1992, *Nambiar & C. Renuka* 2620 (KFRI); Valanchankanam, Peerumedu 24. 11. 1982, *Nambiar & C. Renuka* 2625 (KFRI); Thekkady, 21. 3. 1990, *C. Renuka* 6611 (KFRI); Oachira, Quilon (sea level), 4. 8. 1978, *C.N. Mohanan* 58390 (MH); Pamba dam to Vandiperiyar, Quilon (1000m), 12. 3. 1980, *K. Vivekananthan* 66190 (MH); Kottur RF, Trivandrum (200m), 3. 4. 1973, *J. Joseph* 44016 (MH); Way to Chemmungi, Trivandrum (1275m), 8. 3. 1979, *M. Mohanan* 61741 (MH); Near Suryakanthi river, Bonacaud, Trivandrum (1200m), 22. 5. 1979, *M. Mohanan* 63210 (MH); Forest near Bonaccord, Trivandrum (825m), 21. 8. 1975, *J. Joseph* 46467 (MH).

***Calamus rotang* L.**

Quilon, Asramam, GH compound, 18. 1. 1985, *C. Renuka* 3443 (KFRI).

***Calamus thwaitesii* Becc. et Hook. f.**

Kottiyur, Cannanore (500m), 22. 1. 1979, *V.S. Ramachandran* 59158 (MH); Panampuzha, Nilambur, 27. 3. 1984, *C. Renuka* 3060 (KFRI); Dhoni hills, Palghat, 8. 9. 1982, *Nambiar & C. Renuka* 1949 (KFRI); Shola on the bank of Kunthipuzha, Palghat (1000m), 13. 12. 1980, *N.C. Nair* 69624 (MH); Ezhukone, Quilon (100m), 20. 7. 1979, *C.N. Mohanan* 63196 (MH); Achankovil RF, Shencottah road, Quilon, 22. 4. 1984, *E. Vajravelu* 80561 (MH); Arippa, Quilon Dist., 17. 1. 1985, *C. Renuka* 3430 (KFRI); Valayam, Achenkovil, 8.2. 1983, *Nambiar & C. Renuka* 2905 (KFRI).

***Calamus travancoricus* Bedd. ex Becc.**

Edamalayar, Malayattoor Division, 29.7. 1983, *Nambiar & C. Renuka* 2925 (KFRI); Moozhiar, Ranni, 23. 5. 1984, *C. Renuka* 3154 (KFRI); Moozhiar, Ranni, 9. 10. 1985, *C. Renuka* 4002 (KFRI); Chalakayam - Pamba Forests, Sabarimala RF, Pathanamthitta, 27. 4. 1984, *E. Vajravelu* 80619 (MH); Moozhiar, Quilon (1100m), 3.9. 1977, *N.C. Nair* 50861 (MH); Travancore, 24. 9. 1978, *Fischer* 290 (MH).

***Calamus vattayila* Renuka**

Kottiyur, Wynad, 23. 2. 1984, *C. Renuka & Nambiar* 3029 (KFRI); Moozhiyar, Ranni Division, 9. 10. 1985, *C. Renuka* 4001 (KFRI); Thenmala, 11. 10. 1985, *C. Renuka* 4032 (KFRI); Chittar Valley, Achenkovil, 9. 2. 1983, *C. Renuka & Nambiar* 2907 (KFRI).

***Callicarpa tomentosa* (L.) L.**

Below Silent valley dam site, Palghat (850m), 10.4.1978, *N.C. Nair* 56746 (MH); Thadikundu, Palghat (950m), 14.4.1978, *N.C. Nair* 56795 (MH); Way to Dhoni, Palghat (100m), 27.5.1964, *E. Vajravelu* 19108 (MH);



Panthanthodu, Palghat (850m), 16.7.1969, *E. Vajravelu* 32143(MH); Mukkali, Palghat (200m), 15.10.1965, *E. Vajravelu* 26283 (MH); Silent valley, Palghat, 23.9.1977, *R. Ansari* 51458 (MH); Meenmutty, Idukki (600m), 16.2.1982, *C.N. Muhanun* 73294 (MH); Pullu-para to Peruvanthanam (1000m), 22.1.1965, *K. Vivekananthan* 45343 (MH); Thekkady, Kottayam, 12.3.1973, *B.D. Sharma* 43828 (MH).

***Calophyllum inophyllum* L.**

Kasaragod (sea level), 13. 12. 1931, *G.V Narayana* 6340 (MH); Kasaragod (100m), 15. 10. 1979, *R. Ansari* 64948 (MH); Kumbala, Cannanore (50m), 25. 1. 1979, *KJ. Nair* 59885 (MH); Kumbala, Cannanore (125m), 25. 1. 1979, *VS. Ramachandran* 59229 (MH); Way to Tippu Fort, Palghat, 11. 12. 1984, *K. Ramamurthy* 80465 (MH); Kodungalur, Trichur (50m), 15. 4. 1977, *K. Ramamurthy* 49353 (MH); Kannampara, Pooyamkutty, Idukki (100m), 16.12. 1988, *P. Bhargavan* 69966 (MH); Quilon (msl), 29.5. 1979, *C.N. Muhanun* 63116 (MH); Kottur RF, Trivandrum (175m), 5.4.1973, *J. Joseph* 44057 (MH); Pulimath, Trivandrum (125m), 2. 12. 1977, *M. Muhanun* 52660 (MH); Travancore, 24. 10. 1904, *C.A. Barber* 6671 (MH).

***Canarium strictum* Roxb.**

Silent Valley, Palghat, 30. 8. 1983, *S. ChandBash* 9574 (IFGTB); Vallakadvu, 1965 Eucalyptus plantation, Idukki, 15. 7. 1983, *K.N. Subramanian* 9465 (IFGTB); Kanjiar, Idukki (800m), 23.2. 1983, *C.N. Muhanun* 77951 (MH); Vallakadvu RF, Idukki (850m), 19.3. 1973, *B.D. Sharma* 43937 (MH); Adimali RF, Idukki (1800m), 28. 3. 1980, *K. Ramamurthy* 66544 (MH); Pamba to Thannikudi (1000m), 15. 12. 1981, *C.N. Muhanun* 72820 (MH); Pamba to Vandiperiyar, Idukki (1025m), 28.6. 1968, *D.B. Deb* 30460 (MH); Thekkady, Kottayam (875m), 28. 5. 1965, *K. Vivekananthan* 24374 (MH).

***Cannabis sativa* L. ssp. *indica* (Lamk.) Small et Cronq.**

Kulamavu, Idukki (700m), 5. 6. 1982, *C.N. Mohanan* 74198 (MH).

***Cassia auriculata* L.**

Walayar dam area, Palghat (75m), 25. 10. 1963, *J. Joseph* 17869 (MH).

***Cassia fistula* L.**

Nalukodi, Changanassery (25 m), 5.3. 1984, *V.T Antony* 325 (MH); Attappadi RF, Palghat (825 m), 12. 10. 1965, *E. Vajravelu* 26197 (MH); Chindaki forest, Palghat (650 m), 1. 6. 1966, *E. Vajravelu* 27762 (MH); Parambikulam sub-mergible area, Palghat (607 m), 7. 4. 1963, *K. Ramamurthy* 16141 (MH); Travancore beech South East of Thorai, 4. 11. 1928, *V. Narayanaswami* 1219 (MH); Kottur RF, Trivandrum (175 m), 4.4. 1973, *Joseph* 44027 (MH).

***Chimonobambusa densifolia* (Munro) Nakai**

Agastiyamalai, 17. 1. 1990, *Without coll. name* 6482 (KFRI); Mannavan shola, Munnar, 7. 2. 1996, *Muktesh Kumar and Stephen* 7890 (KFRI).

***Chukrasia tabularis* Juss.**

Parappa, Cannanore, 4.7. 1980, *R. Ansari* 67975 (MH); Near Marappalam, Pothundy-Kaikati, Palghat, 18. 4. 1977, *E. Vajravelu* 48989 (MH).

***Cinnamomum malabattrum* (Burm. f.) BL**

Parambikulam to Orukombankutty (475m), 18. 4. 1977, *K. Ramamurthy* 49356 (MH); Vazhachal, Chalakkudy range, Trichur (130m), 20. 3. 1966, *K. Ramamurthy* 27020 (MH); Forest near Bonaccord Estate, Trivandrum (825m), 21. 8. 1975, *J. Joseph* 46473 (MH); Merchiston to Kallar, Trivandrum (750m), 6. 3. 1980, *K. Vivekananthan* 66111 (MH); Kallar, Trivandrum (250m), 11. 3. 1980, *M. Mohanan* 66650 (MH); Kottur river bank, Trivandrum (175m), 16.3. 1978, *M. Mohanan* 61775 (MH).

***Cinnamomum sulphuratum* Nees**

Karasurya-malai, Palghat (1150m), 5. 3. 1975, *E. Vujravelu* 46202 (MH); Near Munnar (2000m), 23. 3. 1980, *K. Ramamurthy* 66294 (MH); Kalluvaramba, Chooda RF, Thenmalai, 18. 12. 1975, *K.N. Subramanian* 5670 (IFGTB); Way to Agastyarkudam, Trivandrum (1100m), 5. 3. 1980, *M. Mohanan* 66041 (MH).

***Cissampelos pareira* L. var. *hirsuta* (Buch.-Ham. ex DC.) Forman**

Pavagada, near Kerala boarder, Calicut Dist., 15. 8. 1964, *J.L. Ellis* 20426 (MH); Walayar RF, Palghat Dist. (175m), 9.7. 1963, *J. Joseph* 17003 (MH); Erulankadu, Malampuzha Dam, Palghat (100m), 15. 7. 1963, *J. Joseph* 17163 (MH); Thekkumala, Pathanamthitta Dist. (175m), 1. 7. 1988, *N. Anilkumar* 653 (MH); Dhoni RF, Palghat Dist. (150m), 20. 7. 1963, *J. Joseph* 17230 (MHO); Agali RF, Palghat Dist. (575m), 17. 10. 1965, *E. Vajravelu* 26299 (MH); Kuthiran, Peechi Range, Trichur (150m), 18. 5. 1966, *K.M. Sebastine* 27612 (MH); Konni RF, Quilon Dist. (125m), 13. 5. 1978, *C.N. Mohanan* 55536 (MH); Sasthamkotta, Quilon Dist. (100m), 2. 8. 1978, *C.N. Mohanan* 58369 (MH); Nilamel, Trivandrum, 12.5. 1978, *M. Mohanan* 54814 (MH); Pulimath, Trivandrum (125m), 25. 2. 1979, *M. Mohanan* 59381 (MH); High Range, Travancore, Nov. 1918, *R.D. Aushead* 440 (MH); Cerevkanai, Travancore, without date, *V. Narayanaswamy* 77733 (MH).

***Cissus quadrangularis* L.**

Near Ollavayal kudi, Chinnar, 24. 1. 1996, *K.K.N. Nair* 8391

***Cochlospermum religiosum* (L.) Alston**

Shiruvani river side, Chittur - Agali, Palghat, 25.2. 1979, *E. Vajravelu* 60662 (MH); Palghat, 21. 12. 1916, *Without coll. name* 14200 (MH).

***Cosciniumpfenestratum* (Gaertn.) Coleb.**

Travancore, 1871, *Herb. R. Wight* 816 (MH).

***Costus speciosus* (Koen.) Sm.**

Puyarur, Cannanore (500m), 5. 10. 1979, *R. Ansari* 64740 (MH); Chandanathode, Cannanore (675m), 3. 12. 1967, *J.L. Ellis* 29434 (MH); Chandanathode, Cannanore (800m), 12.7. 1978, *V.S.Rarnuchandran* 57572 (MH); Pavagada, Calicut (900m), 15. 8. 1964, *J.L. Ellis* 20434; Taliparamba, Malabar, 20. 9. 1903, *Without coll. name* 9423 (MH); Sappal Hill, Dhoni RF, Palghat (150m), 21. 10. 1963, *J. Joseph* 17839 (MH); Pachakkanam, Idukki (950m), 13. 11. 1975, *K. Vivekanathan* 46667 (MH); Okkari, Thekkady (850m), 29. 9. 1972, *B.D. Sharma* 42350 (MH); Way to Mangaladevi, Thekkady (775m), 27. 8. 1977, *K. Vivekanathan* 50536 (MH); Neriamangalam to Velara forest, Kottayam (525m), 20.8. 1965, *K.M. Sebastine* 25323 (MH); Tenganal, Changanassery (25m), 4.9. 1984, *V.T Antony* 685 (MH).

***Crataeva nurvala* Ham.**

Dhoni, 16.1.1905, *TE Bourdillon* 15582 (IFGTB).

***Croton tiglium* L**

Chandanathode, Cannanore (875m), 1.5. 1979, *V.S.Ramachandran* 61675 (MH); Kannothe RF, Cannanore (250m), 18. 6. 1979, *V.S.Ramachandran* 62665 (MH); Kallamalai area, Palghat, (575m), 13. 3. 1975, *E. Vajravelu* 46293 (MH); Kundam, Muthikulam, Palghat (850m), 29. 4. 1979, *E. Vajravelu* 62972 (MH); Thunbermuzhi forest, Trichur (200m), 18. 3. 1982, *R. Rajan* 73063 (MH); Velara, Kottayam (525m), 21. 8. 1965, *K.M. Sebastine* 25340 (MH); Ponkunnam, Kottayam (100m), 28. 11. 1985, *Fr. Kadavil* 1199 (MH); Mundakayam, Kottayam (500m), 24. 9. 1964, *K. Vivekanathan* 21351 (MH); Athumpankulam, Konni, Pathanamthitta (50m), 20. 12. 1987, *N. Anilkumar* 257 (MH); Palacherry RF, Quilon (300m), 25. 2. 1979, *C.N. Mohanan* 61208 (MH).

***Curculigo orchiioides* Gaertn.**

Hosdurg, Cannanore (40 m), 29. 6. 1980, *R. Ansari* 67916 (MH); Karimbam, Cannanore (175 m), 23. 6. 1980, *R. Ansari* 67813 (MH); Chandanathode, Cannanore; (840 m), 22.2. 1979, *V.S.Rarnuchandran* 61316 (MH); Thaliparamba, Cannanore, 17. 7. 1981, *R. Ansari* 70908 (MH); Manantoddy, near Begur Range Office (825 m), 6. 7. 1978, *V.S.*

*Ramachandran* 54140 (MH); Chedaleth, Calicut (900 m), 29. 8. 1964, *J.L. Ellis* 20497 (MH); Kutiyadi submergible area, Calicut (190 m), 26. 6. 1965, *B. Naithani* 24633 (MH); Walayar, Palghat (100 m), 9. 7. 1963, *J. Joseph* 17018 (MH); Way to Aruvanpara Estate, Palghat (850 m), 24. 4. 1980, *V.J. Nair* 67288 (MH); Pumb house area, Singapala, Palghat (800 m), 26. 5. 1979, *E. Vajravelu* 62824 (MH); Malleswaram temple, Chemmanoor, Palghat (525 m). 14. 10. 1972, *N.C. Nair* 64623 (MH); Parambikulam submergible area, Trichur (100 m), 23. 7. 1962, *K. Ramamurthy* 25997 (MH); Chikala, Chalakkudi, Trichur 18.3 1966, *M. Mohanan* 52832 (MH); Peechi Range, Trichur (175 m), 4. 9. 1976, *J. Joseph* 44076 (MH); Thundathil Range, Malayattoor, Erankulam (840 m), 23.8.1965, *V.S. Ramachandran* 62653 (MH); Erattayar Dam, Idukki (30 m), 28. 9. 1981, *K.M. Sebastine* 25358 (MH); Vallakadavu Eucalypt plantation, Idukki, 13. 12. 1983, *K.N. Subramanian* 9919 (IFGTB); Kulathoor, Kottayam (900m), 14.1.1984, *C.N. Mohanan* 72194 (MH); Punalur, Quilon (300 m), 10.9. 1977, *N.C. Nair* 50977 (MH).

### ***Curcuma amada* Roxb.**

Aralam, Cannanore (250m), 27.4. 1979, *V.S. Ramachandran* 61623 (MH); Kannothe RF, Cannanore (125m), 10.7. 1978, *V.S. Ramachandran* 57530 (MH); Begur RF, Cannanore (825m), 23. 11.1977, *V.S. Ramachandran* 52334 (MH); Mancheri, Malappuram (140m), 4. 8. 1970, *J.L. Ellis* 35371 (MH); Mukkali forest, Palghat (200m), 10.7. 1967, *E. Vajravelu* 26288 (MH); Parambikulam submergible area, Trichur (1240m), 23.7. 1962, *K.M. Sebastine* 14501 (MH); Chalakudy to Adirappally, Trichur (350m), 27.9.1982, *K. Ramamurthy* 74898 (MH); Pinavu-Kulamavu, Idukki (800m), 21. 8. 1981, *K. Vivekananthan & V.S. Rajan* 71138 (MH).

### ***Curcuma aromatica* Salisb.**

Chandanathode, Periya RF, 17.4. 1966, *J.L. Ellis* 21113 (MH); Valiaparathode, Palghat (900m), 26.4. 1980, *V.J. Nair* 67327 (MH); Way to Aruvampara slopes (850), Palghat, 24. 4. 1980, *V.J. Nair* 67290 (MH); Evergreen section, Molankuzhi, Kalady, Malayattoor Division, 12. 7. 1985, *K.N. Subramanian* 11151 (IFGTB); Plachery, Ranni Division (300m), 26.2. 1979, *C.N. Mohanan* 61212 (MH); Sangilipalam, Kulathupuzha, Trivandrum, 6. 8. 1985, *N. Venketasubramanian and K.R. Sasidharan* 11164 (IFGTB).

### ***Curcuma neilgherrensis* Wt.**

Chandanathode, Cannanore (875m), 29.4.1979, *V.S. Ramachandran* 61641 (MH); Sultan's Battery, Calicut (890m), 9. 5. 1965, *J.L. Ellis* 24017 (MH).

### ***Curcuma zedoaria* (Christm.) Rosc.**

Thaliparamba, Malabar, 27. 8. 1935, *Farm Manager* 83058 (MH); Wynad Dist., Thirunelly, *Sabu* 39171 (CALI); Calicut University, Malappuram, *Sabu*

10364 (CAL); Anamalais, Palghat Dist., *C.E.C. Fischer* 3356 (IFGTB); Dhoni, Palghat, *C.E.C. Fischer* 1975 (CAL); Sabarigiri, Pathanamthitta, *Sabu* 37315 (CALI); Vandiperiyar, Kottayam (1000m), 25.5.1965, *K. Vivekananthan* 24323 (MH); Chozhiakodu, Punalur Forest Division, 29. 6.1982, *N. Venketasubramanian* 8396 (IFGTB).

***Cyclea peltata* (Poir.) Hook. f. et Thorns.**

Ambayathode, Cannanore (550m), *V.S. Ramachandran* 65215 (MH); Bekalam, Cannanore (125m), 20. 12. 1980, *R. Ansari* 69918 (MH); Chandanathode, Cannanore, 17.6. 1979, *V.S. Ramachandran* 62648 (MH); Kakkayangud, Cannanore (200m), 26. 2. 1979, *V.S. Ramachandran* 61349 (MH); Poolakkapara, Nedungayam, Malappuram (100m), 25.2. 1970, *J.L. Ellis* 33572 (MH); Tholpetty, Cannanore (800m), 15. 12.1979, *V.S. Ramachandran* 52287 (MH); Shola below Ayyappankovil, Palghat (800m), 27. 10. 1976, *E. Vajravelu* 48726 (MH); On the way to Vazhachal (300m), 24. 1. 1982, *K. Ramamurthy* 72944 (MH); Pachakanam, Idukki (850m), 22.9. 1972, *B.D. Sharma* 40839 (MH); Devicolam (1075m), 23.4.1964, *K.M. Sebastine*, 18394 (MH); Pamba (1000m), 25.3. 1978, *C.N. Mohanan* 54388 (MH).

***Cymbopogon flexuosus* (Nees ex Steud.) Wats.**

Thaliparamba, N. Malabar (150m), 17. 12. 1931, *G.K. Narayanan* 32 (MH); Siruvani (100m), 24. 10. 1968, *D.B. Deb* 60028 (MH); Kuttiyadi submergible area, Calicut (190m), 27. 6. 1965, *B.D. Naithani* 24669 (MH); Dhoni RF, Palghat (125m), 18. 7. 1963, *J. Joseph* 17202 (MH); Silent valley, Palghat (875m), 11. 10. 1965, *E. Vajravelu* 26162 (MH); On the way to Aruvanpara Estate, Palghat (850m), 24. 4. 1980, *V.J. Nair* 67285 (MH); Lockhart gap, Kottayam (1675m), 10.10. 1963, *K.M. Sebastian* 17508 (MH); Kuttykanam, Peerumedu, Kottayam (1025m), 27.11. 1967, *K. Vivekananthan* 29387 (MH); Quilon, Travancore, 9. 10. 1904, *C.A. Barber* 6718 (MH); Travancore, 2. 12. 1941, *K.C. Jacob* 20232 (MH).

***Dendrocalamus strictus* (Roxb.) Nees**

Way to Kaikatti, Nemmara, 8.2. 1995, *Muktesh Kumar and Stephen* 7593 (KFRI).

***Desmodium gangeticum* (L.) DC.**

Makkamala, Manantody special range, Wynad Division, 22. 11. 1983, *K.N. Subramanian* 9896 (IFGTB); Pulimunda, Nedumkayam, Karulai range, Nilambur, 27. 12. 1983, *N. Venketa subramanian* 10126 (IFGTB); Teak stand, Walayar, Palghat Division, 4. 9. 1975, *K.N. Subramanian* 5309 (IFGTB); Banks of Achenkovil river, Konni, 19. 4. 1982, *K.N. Subramanian* 8281 (IFGTB); Kottur RF, Trivandrum Division, 11. 2. 1981, *P. Farooqui* 260 (IFGTB).

***Dioscorea pentaphyllu* L.**

Nedumboil, Malabar (Dt.), 16. 12. 1913, *C.A. Barber* 9634 (MH); Tholpetty, Cannanore (825m), 8. 8. 1979, *V.S. Ramachandran* 62762 (MH); On the way to Peria, Kannothe RF, Cannanore (140m), 13. 11. 1979, *V.S. Ramachandran* 58720 (MH); Chandanathode, Cannanore (810m), 3. 11. 1965, *J.L. Ellis* 26382 (MH); Kurichiyat, Calicut (900m), 17. 8. 1964, *J.L. Ellis* 20462 (MH); Edapallam, Chedalet (900m), 14. 8. 1964, *J.L. Ellis* 19973 (MH); Kuttiyadi, Calicut (190m), 27. 6. 1965, *B.D. Naithani* 24664 (MH); Panthanthode, Palghat (700m), 19. 12. 1969, *E. Vajravelu* 33170 (MH); Kanjirampuzha submergible area, Palghat (1500m), 26. 10. 1964, *K.M. Sebastine* 22319 (MH); Trichur to Kandasankadavu (10m), 7. 9. 1976, *K. Ramamurthy* 47680 (MH); Triveni, Idukki (650m), 10. 10. 1972, *B.D. Sharma* 42460 (MH); Vandiperiyar to Pambanar (1000m), 23. 9. 1964, *K. Vivekananthan* 21332 (MH); Kurisumala, Kottayam (900m), 13. 9. 1984, *V.T. Antony* 767 (MH); Moozhiar, Pathanamthitta (1000m), 3. 9. 1977, *N.C. Nuir* 50867 (MH); Ranni RF, Pathanamthitta (400m), 20. 9. 1988, *N. Anilkumar* 890 (MH); Ariyankavu, Travancore, 22. 10. 1904, *C.A. Barber* 6648 (MH); Merchiston, Trivandrum (850m), 31. 7. 1978, *M. Mohanan* 56985 (MH).

***Diospyros malabarica* (Desr.) Kostel.**

Bela, Kasaragod, (200m), 1. 10. 1982, *R. Ansari* 74437 (MH); Wynaad, 1869, *Maj. R.H. Beddome s.n.* (Acc. No. 30388 MH); Malabar, Herb. Ind. Or. *Hook & Thomson s.n.* (Acc. No. 30385 MH); Munrock Islands, Quilon, 28. 12. 1978, *C.N. Mohanan* 59668 (MH); Quilon, 28. 12. 1978, *C.N. Mohanan* 61232 (MH); Aickad, Quilon (125m), *C.N. Mohanan* 61250 (MH); Adoor, Quilon (125m), 12. 12. 1979, *C.N. Mohanan* 63737 (MH); Ochira, Quilon, sea-level, 16. 12. 1980, *C.N. Mohanan* 65054 (MH); Quilon (400 ft.), 4. 11. 1893, *Lawson, s.n.* (Acc. No. 30396, MH).

***Dipterocarpus indicus* Bedd.**

Ayyappan-kovil, Palghat, 19. 4. 1977, *E. Vajravelu* 49706 (MH); Ayyappan-kovil, Palghat, 4. 3. 1975, *E. Vajravelu* 46184 (MH); Between Kulathupuzha and Aryankavu, Quilon, Nov. 1901, *Without coll. name* 3334 (MH); Between Kulanthupuzha and Aryankavu, Quilon, Nov. 1901, *Without coll. name* 3338 (MH); Between Kulanthupuzha and Camp George, Quilon, Nov. 1901, *Without coll. name* 3336 (MH); Kolathurpolay, Quilon, 4. 12. 1893, *Without coll. name* 3333 (MH).

***Dysoxylum malubaricum* Bedd. ex Hiern**

Forest near bus stand, Pamba, Sabarimala RF, 24. 4. 1984, *E. Vajravelu* 80578 (MH); Travancore (1025m), 30. 1. 1895, *T.F. Bourdillon* 515 (MH); Travancore (700m), 1. 11. 1894, *T.F. Bourdillon* 64 (MH).

***Elettaria cardamomum* (L.) Maton**

Silent Valley, Palghat (950m), 10. 10. 1985, *E. Vajravelu* 26089 (MH); Kummattanthode, Silent Valley, Palghat (800m), 21.4. 1980, *V.J. Nair* 67223 (MH); Kudam to Siruvani, Palghat (850m), 29.4. 1979, *E. Vajravelu* 62990 (MH); Below Kunthipuzha, Palghat (900m), 6. 11. 1976, *E. Vajravelu* 48874 (MH); Pinavu, Idukki (600m), 25. 5. 1982, *C.N. Mohanan* 74016 (MH); Chappathu near Upputhara, Idukki (925m), 30.9. 1981, *C.N. Mohanan* 72085 (MH); Chapppthu, near Uppupara, Idukki, 30.9. 1981, *B. Ramanujan* 72085 (MH); Lockhart gap, Deyicolam, Kottayam (1675m), 12. 10. 1963, *K.M. Sebastine* 17538 (MH); Bonaccord estate, Trivandrum (825m), 2. 10. 1973, *J. Joseph* 44522 (MH); Travancore, 1. 12. 1893, *Without coll. name* 58678 (MH).

***Embelia ribes* Burm.f.**

Chandanathodu, Cannanore (860 m), 15.6.1979, *V.S.Ramachandran* 62622 (MH); Chandanathodu, Cannanore (1050 m), 17.4.1966, *J.E. Ellis* 27101 (MH); Kaikatty farm area, Palghat (950 m), 26.2.1995, *E. Vajravelu* 45752 (MH); Way to Mannarghat from Mukkali, Palghat (600 m), 3.5.1980, *V.J. Nair* 67486 (MH); Devikolam-Munnar road sides, Idukki (1620 m), 7.4.1963, *N.C. Radhakrishnan* 16247 (MH); Lockhart gap, Devikolam, Idukki (1600 m), 20.4.1964, *K.M. Sebastine* 18328 (MH); Peerumedu to Pambanar, Kottayam (100 m), 24.5.1965, *K. Vivekananthan* 24314 (MH); Devikolam to Bodi road, Idukki (2500m), 24.3.1980, *K. Ramamurthy* 66338 (MH); Meenmutty, Idukki (700 m), 20.2.1983, *C.N. Mohanan* 76268 (MH); Meenmutty to Kulamavu, Idukki (700m), 25.1.1983, *A.G.Pandurangan* 76628 (MH); Moozhiar to Kakki, Pathanamthitta (1000 m), 8.5.1988, *R. Chandrasekharan* 88470 (MH); Upper Moozhiar, Pathanamthitta (1000 m), 8.5.1988, *R. Chandrasekharan* 89263 (MH); Pamba, Quilon (1000 m), 26.3.1978, *C.N. Mohanan* 54395 (MH); Ponmudi, Trivandrum (925 m), 16.3.1979, *M. Mohanan* 61767 (MH).

***Entada rheedii* Spreng.**

Kannoth RF, Cannanore, 17.2.1978, *V.S. Rarnachandran* 54028 (MH); 23.2. 1983, *A.N. Henry* 677128 (MH); Kannoth, Malabar, 8. 12. 1913, *Without coll. name* 9503 (MH); Travancore, 25. 1. 1893, *Without coll. name* 18597 (MH); Mukkali, Palghat (550m), 7. 3. 1975, *E. Vajravelu* 46235 (MH); Mandamputty, Palghat (550), 23.2. 1979, *E. Vajravelu* 60620 (MH); Sholayar-Malikka parai, Trichur (1100m.), 5.2.1984, *K. Ramamurthy* 72790 (MH); Valara waterfalls, Munnar, (1800m), 26. 1. 1982, *R. Rajan* 73005 (MH); Pooyamkutty, Idukki (100m), 16. 12. 1988, *P. Barghavan* 89968 (MH); Panankutty, Idukki (400m), 22.2.1983, *C.N. Mohanan* 77930 (MH); Near Kulamavu, Idukki, 28. 1. 1983, *A.G. Pandurangan* 76666 (MH); Thannikudy, Idukki (550m), 2.10. 1972, *B.D. Sharma* 42388 (MH); Thekkady, Kottayam (850m), 15.3. 1973, *B.D. Sharma* 43884 (MH); Kandankayam, Azhutha, Ranni Division 14.9.

1982, *K.N. Subramanian* 8606 (IFGTB); Peppara dam (200m.), 13.3. 1980, *M. Mohanan* 6683 (MH); Peppara, Trivandrum (125m), 17. 12. 1978, *V.S. Ramachandran* 54028 (MH).

*Euphorbia thymifolia* L.

Kalliassery, Cannanore (125m), 22. 6. 1980, *R. Ansari* 64998 (MH); Hosdurg, Cannanore (175m), 23.1.1979, *V.S. Ramachandran* 60030 (MH); Court Road, Tellichery, Cannanore (50m), 21.2. 1978, *V.S. Ramachandran* 54117 (MH); Ezhimalai, Cannanore (250m), 28.6. 1980, *R. Ansari* 67887 (MH); Mattannur, Cannanore (150m), 21. 1. 1979, *V.J. Nair* 59761 (MH); Kannothe, Cannanore (140m), 28.4. 1979, *V.S. Ramachandran* 61663 (MH); Kuttiyadi submergible area, Calicut (190m), 26. 6. 1965, *B.D. Nuithani* 24644 (MH); Nedumboil, Malabar Dist., 15. 12. 1913, *Without coll. name* 9623 (MH); Malampuzha canal, Palghat (100m), 30. 5. 1964, *E. Vajravelu* 19123 (MH); Nenmara, Palghat (325m), 18. 11. 1973, *E. Vajravelu* 44656 (MH); Santhanathodu, Trichur (300m), 26. 11. 1982, *K. Ramamurthy* 75546 (MH); Trichur to Tripprayar (10m), 8. 9. 1976, *K. Ramamurthy* 48415 (MH); Trichur to Kandasankadavu (10m), 7. 9. 1976, *K. Ramamurthy* 47682 (MH); Adoor, Quilon (125m), 1. 4. 1978, *K. Vivekananthan* 54939 (MH); Near Nilamel, Trivandrum (125m), 12.9. 1979, *M. Mohanan* 54818 (MH).

*Garcinia cambogia* (Gaertn.) Desr.

Kadakkal thodu, Chalakudy, 24.2. 1982, *K.N. Subramanian* 7989 (IFGTB); Payampara, Chalakudy, 24. 2. 1982, *K.N. Subramanian* 7974 (IFGTB); Anamallays, 1871, *R.H. Beddome* s.n., (MH); Cochin, 1884, *M.A. Lawson* s.n. (MH); Travancore, *M.A. Lawson* s.n. (MH); Konni, Travancore, 2. 1. 1905, *T.F. Bourdillon* 1585 (MH); Kumarakamperur RF, Konni, 19.4. 1982, *K.N. Subramanian* 8233 (IFGTB); Kottur RF, Trivandrum, 17.7. 1978, *K.N. Subramanian* 7248 (IFGTB).

*Garcinia gummi-gutta* (L.) Robs.

Sigamparai to Vattapparai, Siruvani western slopes (775m), 28. 5. 1979, *E. Vajravelu* 62940 (MH); Kudam to Muthikulam (850m), 28. 4. 1979, *E. Vajravelu* 62941 (MH); Bank of Kummattam-thodu, Silent valley RF (859m), 17. 3. 1984, *N.C. Nair* 81262 (MH); Aruvampara estate, Palghat (900m), 24. 4. 1980, *K.J. Nair* 67281 (MH); Mandampatty, Palghat (550m), 15.4. 1978, *N.C. Nair* 106245 (MH); Near dam site, Silent valley (1100m), 9.4. 1978, *N.C. Nair* 56703 (MH); Kulathupuzha, Quilon Dist. (125m), 20. 2. 1979, *C.N. Mohanan* s.n. (MH); Swamp above Edapalayam, Quilon (750m), 9.3. 1970, *K. Vivakanandan* 66174 (MH); On the way to Kurishumalai, Bonacaud, Trivandrum (800m), 23.8. 1975, *J. Joseph* 46501 (MH); Vithura to Bonacaud, Trivandrum (650m), 23.5. 1979, *M. Mohanan* 63219 (MH).



***Gloriosa superba* L.**

Kasaragod (800m), 1. 10. 1982, *R. Ansari* 74426 (MH); Tholpetty, Wynad (825m), 6. 7. 1978, *V.S.Ramachandran* 54145 (MH); Odapallam, Chedleth, Wynad (900m), 14. 8. 1964, *J.L. Ellis* 19981 (MH); Olavakod, Palghat (75m), 17. 10. 1963, *J. Joseph* 17771 (MH); Kanjiram-puzha, Palghat (1500m), 26. 10. 1964, *K.M. Sebastine* 22303 (MH); Mukkali, Palghat (530m), 14. 10. 1965, *E. Vajravelu* 26224 (MH); Mathur, Kollengode, Palghat (325m), 23. 11. 1973, *E. Vajravelu* 44797 (MH); Mukkali, eastern slopes, Palghat (500m), 25. 9. 1977, *P. Bhargavan* 65748 (MH); Anamooly, Palghat (500m), 25.9. 1977, *R. Ansari* 51483 (MH); Painavu-Cheruthoni Road, Idukki (800m), 11.11. 1981, *C.N. Mohanan* 71233 (MH).

***Gmelina arborea* Roxb.**

Chindaki forest, Palghat (650m), 1. 6. 1966, *E. Vajravelu* 27758 (MH); Malampuzha, Palghat (125m), 29.5. 1964, *E. Vajravelu* 19113 (MH); Karivara, Palghat (750m), 16.4. 1978, *N.C. Nair* 56868 (MH); Machad range, Trichur (150m), 6.4. 1977, *K. Ramumurthy* 49232 (MH); Mangalam dam, Palghat (925m), 2. 3. 1975, *E. Vajravelu* 49232 (MH); Mullakudy, Idukki (850m), 14. 3. 1973, *B.D. Sharma* 43853 (MH); Meenkuthy, Idukki (800m), 25.2. 1983, *C.N. Mohanan* 77982 (MH); Aickad, Adoor, Quilon (125m), 4.4.1980, *C.N. Mohanan* 68325 (MH).

***Gymnema sylvestre* (Retz.) R. Br. ex Schult.**

Parayal, Peria, Wynad, 16. 2. 1982, *K.N. Subramanian* 7813 (IFGTB); Chandanathode, Cannanore (920m), 30. 6. 1965, *J.L. Ellis* 25258 (MH); Kannavam, Cannanore, (150m), 10.7. 1978, *V.S. Ramachandran* 57526 (MH); Calicut road, Cannanore, (725m), 12.2.1978, *V.S. Ramachandran* 53894 (MH); Pullimanpatti, Walayar, Palghat, 4. 9. 1975, *K.N. Subramanian* 5295 (IFGTB); Walayar forest, Palghat (75m), 9.7. 1963, *J. Joseph* 17006 (MH); Dhoni RF, Palghat (125m), 18.7. 1963, *J. Joseph* 17198 (MH); Pulikkal forest, Palghat (1200m), 20. 1. 1964, *K.M. Sebastine* 29853 (MH); Pananyotery, Palghat (150m), 2.11.1976. *E. Vajravelu* 48823 (MH); Meenmutty, Idukki (600m), 29.5.1982. *C.N. Mohanan* (MH); Kulamavu to Ayyappankavu, Idukki (600 m), *C.N. Mohanan* 74031 (MH); Aram Mile, Idukki (600m), 27.1.1982. *K. Ramamurthy* 73017 (MH).

***Helicteres isora* L.**

Mukkali forest Palghat (550m), 11. 10. 1979, *N.C. Nair* 64513 (MH); Chindaki forest, Palghat (600m), 9. 10. 1965, *E. Vajravelu* 26005 (MH); Erulankadu, Malampuzha Dam, Palghat (100m), 15. 7. 1963, *J. Joseph* 17165 (MH); Pothundi to Kaikatty (500m), Nemmara, 20. 11. 1973, *E. Vajravelu* 44725 (MH); Tholnada, Idukki (100m), 13. 12. 1988, *Bhargavan* 87500 (MH); Meenmutty, Palghat, 15.2. 1982, *C.N. Mohanan* 73280 (MH); Panamkutty,

Idukki (500m), 27. 12. 1983, *A.G. Pandurangan* 62559 (MH); Kulamavu, Idukki (750m), 23.9. 1981, *C.N. Mohanan & B. Ramanujan* 71926 (MH); Changanachery, St. Berchman's College, 8. 1. 1984, *U.J. Antony* 94 (MH); Palakayam, Kanjarampuzhasubmergible area, Kottayam, (1200m), 21.7. 1964, *K.M. Sebastine* 20885 (MH); Way to Ottapally, Quilon (200m), 24. 2. 1979, *C.N. Mohanan* 61192 (MH); Moozhia, Quilon (1100m), 3.9. 1977, *N.C. Nair* 50855 (MH); Kumaramperur RF, Konni, Quilon (150m), 13. 11. 1976, *M. Chandrabose* 49003 (MH); Achenkovil-Alapady, Travancore, 9. 10. 1928, *V. Narayanaswami* 841 (MH).

*Hemidesmus indicus* (L.) R. Br.

Anamooly, Palghat (500m), 25. 9. 1977, *R. Ansari* 51482 (MH); Between Pothundy and Kaikatty, 20. 11. 1973, *E. Vajravelu* 44707 (MH); Panthanthodu, Palghat (700m), *E. Vajravelu* 33162 (MH); Chindaki Forest (600m), 9. 10. 1965, *E. Vajravelu* 26028 (MH); Kanjarampuzha, submergible area, Palghat (1200m), 8. 3. 1965, *K.M. Sebastine* 22831 (MH); Dhoni RF, Palghat (1500m), 21. 10. 1963, *K.M. Sebastine* 21087 (MH); Muthikurensi, Mannarghat, Palghat, 4. 12. 1975, *K.Swarupanandan* 13811 (MH); Parambikulam submergible area (1240m), 20. 11. 1962, *K.M. Sebastine* 15044 (MH); Chikala, Chalakudi range, Trichur (100m), 9. 12. 1965, *K.M. Sebastine* 26695 (MH); Vazhachal to Sholayar (400m), 23.9. 1982, *K. Ramamurthy* 75765 (MH); Pampadi, Kottayam (75m), *V.T.Antony* 863 (MH); Mookampatty RF., Kottayam, 15.9. 1982, *K.N. Subramanian* 8700 (IFGTB); Vallakadavu, Idukki, 15.7. 1983, *K.N. Subramanian* 9467 (IFGTB); Kumeramperur RF, Konni, 18.4. 1982, *K.N. Subramanian* 8243 (IFGTB); Vettoor, Konni RF, Quilon (100m), 19.11.1976, *M. Chandrabose* 49136 (MH); Azhutha river bank, Ranni, 14.9.1982, *K.N. Subramanian* 8634 (IFGTB); Milamoodu, Trivandrum, 22. 11. 1977, *M. Mohanan* 52613 (MH); Kottur RF, Trivandrum (175m), *J. Joseph* 44020 (MH); Ponmudi, Trivandrum (850m), *M. Mohanan* 69203 (MH).

*Heracleum ringens* Wall. ex DC.

‘Microwavestation, Pynavu, Idukki (900 m), 8.11.1981, *VS.Raju* 71215 (MH); Mangaladevi temple, Idukki (1350), 9.10.1976, *K. Vivekanthan* 48629 (MH); Lock heart gap, Kottayam (1675 m), 10.10.1963, *K.M. Sebastine* 17502 (MH); Kurishumala, Kottayam (950 m), 9.11.1984, *Rev. Fr. Kadavil* 971 (MH).

*Holarrhena pubescens* (Buch.-Ham.) Wall. ex G. Don

Walayar RF, Palghat, 1.7. 1977, *K.N. Subramanian* 6778 (IFGTB); Ambabar Block, Achenkovil RF, Punalur, 13.4.1982, *K.N. Subramanian* 8109 (IFGTB); Kumaramperur RF, Konni Division, 18.4. 1982, *K.N. Subramanian* 8242 (IFGTB); Banks of Achenkovil river, Konni, 19.4. 1982, *K.N. Subramanian* 8280 (IFGTB); Southern side of Kulathupuzha, Thenmala, 24.4. 1974, *K.N. Subramanian* 5971 (IFGTB).

***Holostemma annulare* (Roxb.) Schum.**

Calicut University Campus, Malappuram Dist., 2. 8. 1976, *K. Swarupananthan* 13979 (MH); Olavakkot, Palghat (75m), 17. 10. 1963, *J. Joseph* 17767 (MH); Pottassery, Mannarghat, Palghat, 17. 9. 1975, *K. Swarupananthan* 13804 B (MH); Malampuzha, Palghat, 11. 9. 1977, *K. Swarupananthan* 13749 (MH); Chalakkuddy to Adirappally, Trichur Dist. (350m), 27. 9. 1982, *K. Ramamurthy* 74895 (MH); Idukki, banks of the reservoir (700m), 14. 6. 1983, *A.G. Pandurangan* 79231 (MH); Kalavoor, Aleppy, 10. 9. 1976, *K. Swarupananthan* 13649 B (MH); Kottur RF, Trivandrum (250m), 27. 8. 1975, *J. Joseph* 46533 (MH); Kurisumalai, Trivandrum (750m), 23.5. 1979, *M. Mohanan* 63241 (MH).

***Hopea parviflora* Bedd.**

Parappa, Cannanore, 8.5. 1982, *K.J. Nair* 71090 (MH); Parappa, Cannanore, 31. 12. 1980, *R. Ansari* 70082 (MH); Kannothe, Cannanore, 19. 3. 1980, *KS. Ramachandran* 66812 (MH); Wynad, 1866, *R.H. Beddome* 3351 (MH); Bank of Karimpuzha, Nilambur, 15. 3. 1984, *N.C. Nair* 81250 (MH); Dam site, Aruvampara slopes, Palghat, 6. 12. 1980, *N.C. Nair* 69141 (MH); Aruvampara slopes, Palghat, 19. 1. 1980, *P. Bhargavan* 65596 (MH); Mankayam to Karappara, Palghat, 21. 12. 1980, *N.C. Nair* 69724 (MH); Kaikatti to Pothundi, Palghat, 28.2. 1975, *E. Vajravelu* 45792 (MH); Valiyaparathodu, Silent Valley, Palghat, 26.4. 1980, *V.J. Nair* 67312 (MH); Chalakudy river side, Trichur, 22.3. 1980, *K. Ramamurthy* 66277 (MH); Idukki, Kezhali-puzha eastern side, 21. 12. 1988, *P. Bhargavan* 90037 (MH); Thorai, Travancore, 7. 11. 1928, *K. Narayanaswamy* 1323 (MH); Edapalayam to Thenmalai, Quilon, 9. 3. 1980, *K. Vivekananthan* 66169 (MH); Kallar - valley, Quilon, 21. 4. 1984, *E. Vajravelu* 80547 (MH); Ponmudi, Trivandrum, 11.6. 1976, *C.E. Ridsale* 127 (MH); Ponmudi to Kallar, Trivandrum, 6. 3. 1980, *K. Vivekananthan* 66115 (MH); Peppara dam, Trivandrum, 13.3. 1980, *M. Mohanan* 66686 (MH); Kotur RF, Trivandrum, 17. 3. 1978, *M. Mohanan* 54687 (MH).

***Hydnocarpus pentandrus* (Ham.) Oken**

Near Kallar river, Konni RF, (150m), 17. 11. 1976, *M. Chandrabose* 49096 (MH); Moozhier RF, Pathanamthitta (600m), 20.3. 1978, *C.N. Mohanan* 54317 (MH); Thenmala, Punalur, Quilon (650m), 8.3. 1980, *K. Vivekananthan* 66155 (MH); Mylammoodu, Kulathupuzha, Quilon (750m), 10. 3. 1980, *K. Vivekananthan* 66177 (MH); Quilon, Travancore, 30. 10. 1904, *C.A. Barber* 6720 (MH); Palaruvi, Aryankavu (500m), 18.12. 1978, *C.N. Mohanan* 59514 (MH).

***Ichnocarpus frutescens* (L.) R. Br.**

Nedumboil, Malabar, 16. 12. 1913, *Without coll. name* 9633 (MH); Mukkali, near Rest House, Palghat, 23. 9. 1977, *K.N. Subramanian* 7061 (IFGTB);

Walayar, Palghat, 17. 11. 1976, *K.N. Subramanian* 6461 (IFGTB); Varalipara, Walayar, Palghat, 18.9. 1975, *K.N. Subramanian* 5351 (IFGTB); Malampuzha, Palghat (100m), 14. 7. 1963, *J. Joseph* 17148 (MH); Vetrilaichola, Pulikkal forest, Palghat (1200m), 20.7. 1964, *K.M. Sebastine* 20866 (MH); Chalakkudy to Adirappally, Trichur (350m), 27. 9. 1982, *K. Ramamurthy* 74896 (MH); Wadakkanchery to Kunnamkulam, Trichur (50m), 2. 10. 1990, *P. Bhargavan* 92071 (MH); Mukkada, Kottayam, 24.9. 1984, *V.T. Antony* 790 (MH); Near Aroor bridge, Aleppy 31. 12. 1990, *M.S. Swaminathan* 95683 (MH); Thavazhappara, Konni RF, (225m), 18. 11. 1976, *M. Chandrabose* 49100 (MH); Aickad, Kodumon, Quilon (125m), 10.6. 1979, *C.N. Mohanan* 63153 (MH); Aryankavu, Travancore, 22. 10. 1904, *C.A. Barber* 6639 (MH); Nadayara, Trivandrum (75m), 13. 11. 1979, *M. Mohanan* 63845 (MH); Pulimath, Trivandrum (125m), 22. 11. 1979, *M. Mohanan* 65198 (MH).

### ***Indigofera tinctoria* L.**

Kumbala, Cannanore, 14.10.1979 (160 m), *R. Ansari* 64918 (MH); Sreekantapuram, Cannanore (200 m), 24.6.1980, *R. Ansari* 67823 (MH); Mukkali, Palghat (550m), 12.10.1979, *N.C. Nair* 64507 (MH); Karapara river side, Palghat (850m), 21.12.1980, *N.C. Nair* 69717 (MH); Vettilachola, Pulikkal forest, Palghat (1200 m), 20.7.1964, *K.M. Sebastine* 20858 (MH); Parambikulam to Vazhachal, Trichur (475 m), 19.4.1977, *K. Ramamurthy* 49394 (MH); Vaikom, Kottayam (5m), 20.8.1984, *V.T. Antony* 644 (MH).

### ***Indocalamus wightianus* (Nees) Nakai**

Near Kappakkanam, Idukki, 28. 6. 1982, *C.N. Mohanan* 74060 (MH).

### ***Ipomoea mauritiana* (L.) Jacq.**

Panathur, Cannanore (250m), 29.6. 1980, *R. Ansari* 67895 (MH); Manjeshwer, Cannanore (100m), 13. 10. 1979, *R. Ansari* 64884 (MH); Kannavam, Cannanore (150m), 8. 2. 1978, *V.S. Ramachandran* 54023 (MH); Mathumoola, Changanassery (10m), 3.9. 1984, *V.T. Antony* 679 (MH); Ranni RF, Pathanamthitta (300m), 19. 5. 1980, *C.N. Mohanan* 65099 (MH); Veli, Trivandrum (75m), 4.8.1978, *M. Mohanan* 58550 (MH); Pulimath, Trivandrum (125m), 22. 11. 1979, *M. Mohanan* 65197 (MH).

### ***Kaempferia galanga* L.**

Silent Valley RF, Palghat, 3. 4. 1979, *E. Vajravelu* 62994 (MH); Quilon, 21. 9. 1927, *Without coll. name* 108215140 (MH).

### ***Kingiodendron pinnatum* (Roxb. ex DC.) Harms**

Kulakera parai, Trivandrum, 4. 11. 1928, *V. Narayanaswamy* 1218 (MH); Travancore, 1873, *R.H. Beddome, s.n.* (Acc. No. 18521 - MH).

***Kydia calycina* Roxb.**

Tholpetty, Begur range Cannanore, 20. 11. 1977, V.S. *Ramachandran* 52253 (MH); Attappady RF, Palghat, 12. 10. 1965, E. *Vajravelu* 26202 (MH); Panthanthodu, Palghat, 18. 12. 1969, E. *Vajravelu* 33121 (MH); Chindaki, Palghat, 16. 10. 1979, N.C. *Nair* 64677 (MH); Mukkali, Palghat, 27. 11. 1973, E. *Vajravelu* 44849 (MH).

***Limonia acidissima* L.**

Parappa, Cannanore (250 m), 4. 7. 1980, R. *Ansari* 67981 (MH); Kannothe RF, Cannanore (150 m), 11.7. 1978, K.S. *Ramachandran* 57556 (MH); Sultan's Battery, Wynad (890 m), 9. 5. 1965, J. L. *Ellis* 24001 (MH); Conolly Teak Plantation, Nilambur (75 m), 9.5. 1965, J.L. *Ellis* 35325 (MH); Dhoni, Palghat (100m), 17.7. 1963, J. *Joseph* 17168 (MH); Mukkali forest, Palghat (500 m), 26. 8. 1966, E. *Vajravelu* 27836 (MH); Kunnamkulam to Vadakkancherry, Trichur (50 m), 10.9. 1976, E. *Vajravelu* 32053 (MH).

***Madhuca nerifolia* (Moon.) H.J. Lam.**

Kannoth, Malabar, 10. 12. 1913, *Without coll. name* 9547 (MH); Panathur, Cannanore (450m), 28. 12. 1980, R. *Ansari* 70060 (MH); Kannothe RF, Cannanore (140m), 26. 3. 1980, V.S. *Ramachandran* 66897 (MH); Begur RF, Cannanore (800m), 3. 3. 1979, V.S. *Ramachandran* 62032 (MH); Thirunelli RF, Cannanore (700m), 7. 5. 1979, K.S. *Ramachandran* 62704 (MH); Kuttampuzha, Ernakulam Dist. (120m), 16. 2. 1970, B.V. *Shetty* 33523 (MH); Kakkad river bank, Ranni, 25. 2. 1983, N.D. *Madhavan*, N. *Venkatasubramanian* and K.R. *Sasidharan* 9212 (IFGTB); Kallar river bank, Konni, 22. 1. 1983, K.N. *Subramanian* 9036 (IFGTB); Aynarallur RF, Punalur Forest Division, 6. 3. 1982, K.N. *Subramanian* 8072 (IFGTB); Kulamkunnu, Arichal, Thenmala, 9. 3. 1975, K.N. *Subramanian* 5140 (IFGTB); Ponnudi, Trivandrum, 10. 2. 1981, P. *Farooqui* & N. *Venkatasubramanian* 199 (IFGTB).

***Malaxis rheedii* Sw.**

Cheenvattur, Cannanore (50m), 30.6.1980, R. *Ansari* 67924 (MH); Kannothe RF, Cannanore (150 m), 11.7.1978, V.S. *Ramachandran* 57759 (MH); Chandanathodu, Cannanore (920 m), 26.6.1965, J.L. *Ellis* 25184 (MH); Silent Valley RF, Palghat (900 m), 21.12.1969, E. *Vajravelu* 33199 (MH); Meenmutty, Kulamavu, Idukki (700 m), 9.6.1983, A.G. *Pandurangan* 76668 (MH); Kattapana, Idukki (900 m), 26.9.1981, C.N. *Mohan* 72011 (MH); Kurisumala (Vagumon), Kottayam (900 m), 13.9.1984, A.T. *Antony* 764 (MH); Peruvanthanam, Kottayam (500 m), 24.9.1964, K. *Vivekananthan* 21356 (MH); Umaiya malai, Devicolum, Kottayam (1975 m), 22.11.1965, B. K. *Shetty* 26626 (MH); Way to Suryakanthi river, Bonnacad, Trivandrum (700 m), 21.5.1979, M. *Mohan* 61888 (MH).

***Mesua ferrea* L.**

Mananthody, Wynad, 11. 2. 1982, *K.N. Subramanian* 7880 (IFGTB); Ayyappankovil (800m), Palghat, 27. 10. 1976, *E. Vajravelu* 48723 (MH); Kunthipuzha, Palghat, (825m), 9. 4. 1978, *N.C. Nair* 56673 (MH); Rockwood forests, 3. 6. 1964, *K.N. Subramanian* 1562 (IFGTB); Muthikulam range, Palghat, 24. 3. 1976, *K.N. Subramanian* 5822 (IFGTB); Gavi dam area, Idukki (1000m), 12. 10. 1983, *A.G. Pandurangan* 78007 (MH); Calvary Mountains, Idukki (1100m), 6. 10. 1983, *A.G. Pandurangan* 79271 (MH); Way to Pamba, Moozhiar (800m), 11.9. 1987, *N. Anilkumr* 59 (MH); Kallar, Devikolam (975m), 23. 4. 1964, *K.M. Sebastine* 19301 (MH); Adimali range, Munnar, 28.5. 1964, *K.N. Subramanian* 1421 (IFGTB); Mamoodu first bridge, Thenmala, 6. 3. 1975, *K.N. Subramanian* 5014 (IFGTB); Thenmala Forest Division, 23. 7. 1980, *P. Farooqui and Venkatasubramanian* 187 (IFGTB).

***Mimusops elengi* L.**

Peradala, Kasaragod (200 m), 7. 5. 1982, *V.J. Nair* 71047 (MH); Cheruvathoor, Cannanore, (50 m), 30. 6. 1980, *R. Ansari* 67923 (MH); Kumarikulam shola, Thannikudi, Idukki (1025 m), 10. 2. 1987, *N.C. Nair* 70169 (MH); Thuruthy, Changanacherry (20 m), 16. 11. 1984, *V.T. Antony* 984 (MH); Placherry, Ranni, 26. 2. 1979, *C.N. Mohanan* 61215 (MH); Odura, Quilon, 4. 8. 1978, *C.N. Mohanan* 58396 (MH); Kuriapuzhai Kovil, Travancore, 5. 11. 1904, *C.A. Barber* 6778 (MH); Trivandrum Zoo (125 m), 4. 12. 1977, *C.N. Mohanan* 52752 (MH).

***Mucuna pruriens* (L.) DC.**

Neddikarna to Nedimballi, S. Wynad, 14. 1. 1903, *C.A. Barber* 5622 (MH); Kannothe, Malabar Dt., 9. 12. 1913, *Without coll. name* 9538 (MH); Mathur, Kollengode slopes, Palghat (326m), 23. 11. 1973, *E. Vajravelu* 44806 (MH); Panthanthode, Palghat (825m), 18. 12. 1969, *E. Vajravelu* 3314 (MH); Thunakadavu, Parambikulam (667m), 28. 10. 1964, *K.M. Sebastine* 22379 (MH); Adirappally forest, Trichur (350m), 28. 11. 1982, *R. Rajan* 75592 (MH); Panjanamkattu, Poringal range, Vazachal, 19. 12. 1984, *K.N. Subramanian* 10843 (IFGTB); Kattappana, Idukki (1000m), 11. 11. 1981, *C.N. Mohanan* 72449 (MH); Kuttikkanam to Peerumedu (1025m), 23. 11. 1967, *K. Vivekananthan* 29304 (MH); Kurusumala, Kottayam (900m), 13. 9. 1984, *V.T. Antony* 776 (MH); Pamba to Anathodu (1000m), 16. 12. 1974, *K. Vivekananthan* 45297 (MH).

***Myristica malabarica* Lamk.**

Vallappara to Chikkur (450m), Palghat, 29. 5. 1979, *E. Vajravelu* 62877 (MH); Mukkali, Palghat (550m), 24. 1. 1980, *P. Bhargavan s.n.* (MH); Kulathupuzha, Quilon, 13.2. 1979, *C.N. Mohanan* 61162 (MH); Swamp above

Edapalayam, Quilon (750m), 9. 3. 1980, *K. Vivekananthan* 66175(MH); Travancore, 3. 1890, *Bourdillon* 535 (MH); Colatur Polay, Travancore, 26. 11. 1894, *T.F. Bourdillon* 115 (MH); Choodal RF, Thenmala Forest Division, 2. 6. 1964, *K.N. Subramanian* 1542 (IFGTB); Thenmala- Trivandrum Road, Forest office side, 20. 11. 1961, *K.N. Subramanian* 76994 (IFGTB).

***Nervilia aragoana* Gaud.**

Dhoni RF, Palghat (250m), 21.10. 1963, *J. Joseph* 17820(MH); Poongavanam, Sabarimala, Pathanamthitta (650 m), 15.2. 1981, *N. C. Nair* 70214 (MH); Way to Sabarimala temple, Pathanamthitta, 25.4. 1984, *E. Vajravelu* 80589 (MH); Achankovil tribal colony, Quilon, 20. 4. 1984, *E. Vajravelu* 80544 (MH).

***Nilgirianthus ciliatus* (Nees) Bremek.**

Kannavam, Cannanore (140 m), 16. 2. 1978, *V.S. Ramachandran* 54007 (MH); Panathur, Cannanore, 28. 12. 1980, *R. Ansari* 70057 (MH); Kannothe, Cannanore, 21. 2. 1979, *V.S. Ramachandran* 60068 (MH); Payyavur, Cannanore (350 m), 21. 12. 1980, *R. Ansari* 69928 (MH); Adirappally RF, Trichur (100 m), 10. 12. 1965, *K.M. Sebastine* 26724 (MH); H.P.C. Campshed, Pooyamkutty, Idukki, 20. 12. 1988, *P. Bhargavan* 90023 (MH); Panayampala, Changanassery (100 m), 28. 1. 1984, *V.T Antony* 228 (MH); Kulamavu, Idukki (1200 m), 8. 6. 1984, *C.N. Mohanan* 82033 (MH).

***Nothapodytes nimmoniana* (Grah.) Mabber.**

Thundathil range, Kalady, Ernakulam (30m), 23. 8. 1965, *K.M. Sebastine* 25360 (MH); Devicolam, Idukki (1550m), 14. 10. 1963, *K.M. Sebastine* 17549 (MH); Bharananganum, Kottayam (30m), 13. 8. 1984, *V.T Antony* 607 (MH).

***Ochlandra beddomei* Gamble**

Wynad, Thariodu, 22. 12. 1988, *Muktesh Kumar* 6466 (KFRI).

***Ochlandra ebracteata* Raiz. et Chatt.**

Palappilly subcentre, Trichur (60m), 15. 1. 1994, *Muktesh Kumar & Joy* 6769 (KFRI); Milepalam, Arippa, 19. 1. 1989, *Muktesh Kumar* 6473 (KFRI); Kottavasal, on the way to Achenkovil, 11. 11. 1992, *Jayalakshmi* 6494 (KFRI); Achenkovil(300m), 10.9. 1994, *Muktesh Kumar & Stephen* 7610 (KFRI).

***Ochlandra scriptoria* (Dennst.) Fisch.**

Chandanathodu, Cannanore (840m), 20.3.1980, *KS. Ramachandran* 58288, 66838, 61396 (MH); Parambikulam, Cheramedu, Kuriarkutty, 4. 7. 1988, *Muktesh Kumar* 6437 (KFRI); Idukki, 13. 12. 1988, *Muktesh Kumar* 6458 (KFRI); Peruvannamuzhi, Calicut, 19.4. 1988, *Muktesh Kumar* 6418 (KFRI);

Parambikulam, Palghat Dist., 4. 7. 1988, *Muktesh Kumar* 6437 (KFRI); Nedumkayam, Nilambur, 7. 4. 1988, *Muktesh Kumar* 6414 (KFRI); Marappalam, Thundathil range, Malayattoor, 13. 12. 1988, *Muktesh Kumar* 6458 (KFRI); Ponnudi, Trivandrum, 2. 12. 1905, *C.A. Barber* 7190 (MH).

***Ochlandra sivagiriana* (Gamble) Camus**

Vazhachal, Trichur Dist., 28. 12. 1993, *Muktesh Kumar* 6735 (KFRI).

***Ochlandra travancorica* (Bedd.) Benth.**

Kannoth RF, Cannanore (250m), 7. 11. 1978, VS. *Ramachandran* 60838 (MH); Manalaru to Karapara, Palghat (850m), 23. 12. 1980, *N.C. Nair* and *P. Bhargavan* 69760 (MH); Mancheri, Nilambur, 7. 4. 1988, *Muktesh Kumar* 6416 (KFRI); Pooppara section, Karimala range, Parambikulam, 5. 7. 1988, *Muktesh Kumar* 6438 (KFRI); Neriamangalam, Munnar Road, Malayattoor Division, 12. 12. 1988, *Muktesh Kumar* 6446 (KFRI); Edamalayar, Malayattoor Division, 13. 12. 1988, *Muktesh Kumar* 6457 (KFRI); Pooyamkutty, Idukki (600m), 17. 6. 1983, *A.G. Pandurangan* 79243 (MH); Vallakkadavu RF, Idukki (850m), *B.D. Sharma* 43940 (MH); Angamuzhi road, Ranni, 7. 6. 1988, *Muktesh Kumar* 6429 (KFRI); Bonacaud, Trivandrum 10. 7. 1984, *M. Mohanan* 61719 (MH); Agastiyar-malai, Trivandrum, 17. 1. 1990, *Muktesh Kumar* 6481 (KFRI).

***Ochlandra wightii* (Munro) Fisch.**

Nedumgayam, Nilambur, 21.2. 1969, *D.B. Deb* 30386 (MH); Nedumgayam to Meenmutty, Malappuram (650m), 13. 3. 1984, *N.C. Nair* 81230 (MH); Pamba, Kottayam (1025m), 25.6. 1968, *D.B. Deb* 30386 (MH); Uppupara, Vallakkadavu, Idukki Dist., 21.2. 1989, *Muktesh Kumar* 6475 (KFRI); Pamba Dam to Anathode, Quilon (1050m), 9. 11. 1975, *V. Vivekananthan* 46586 (MH); Achenkovil, 12.6. 1992, *K.K. Seethalakshmi* 6707 (KFRI); Chazhikodu, Kulathupuzha, Trivandrum, 24. 6. 1992, *Jayalakshmi* 6498 (KFRI); Kottur RF, Trivandrum (150m), 8. 4. 1973, *J. Joseph* 44088 (MH); Nedumangad, Trivandrum 29. 11. 1905, *C.A. Barber* 7176 (MH); Kallar, Trivandrum, 1. 12. 1905, *C.A. Barber* 7176 (MH).

***Oroxylum indicum* (L.) Vent.**

Banks of Achenkovil river, Konni, Quilon (185 m), 19. 11. 1976, *M. Chandrubose* 40113 (MH); Mambazhathara, Quilon (450 m), 10. 9. 1977, *N.C. Nair* 50969 (MH); Travancore, *V. Narayanaswami* 77943 (MH).

***Palaquium ellipticum* (Dalz.) Baill.**

Chandanathode, Cannanore (780m), 13.2. 1978, *V.S. Ramachandran* 53928 (MH); Chandathode, Cannanore (875m), 14. 8. 1979, VS. *Ramachandran* 63938 (MH); Chandathode Cannanore (650m), 19.4. 1966, *J.L. Ellis* 27148



(MH); Wynad, *Without coll. name*, 1866, *Beddome* 29797 (MH); E.B. Colony, Kudam, Muthikulam, Palghat (850m), 27.4. 1979, *E. Vajravelu* 62928 (MH); Kunthipuzha, Palghat (1000m), 10.3. 1975, *E. Vajravelu* 46264 (MH); Aruvampara Estate, Palghat (700m), 4.5. 1980, *XJ. Nair* 67508 (MH); Vattappara, Siruvani RF, Palghat, 25.1. 1984, *E. Vajravelu* 77763 (MH); Thathengalam, Palghat (950m), 27.4. 1977, *E. Vajravelu* 49797 (MH); Above dam site, Silent Valley, Palghat (1100m), 9.4. 1978, *N.C. Nair* 56693 (MH); Poovanchola, Silent Valley, Palghat (1000m), 8.3. 1984, *N.C. Nair* 81149 (MH); Vellaramulley, Idukki (1100m), 19.11.1990, *M. A. Luwson* 29778 (MH); Kanjiat, Idukki (800m), 23.2. 1983, *C.N. Muhanun* 77946 (MH); Adimali RF, Idukki (1500m), 28.3. 1980, *R. Rajan* 66551 (MH); Cardamom hills, Munnar - Periyar Road, 17.6.1976, *C.E. Ridsdale* 160 (MH); Pamba dam, Vandiperiyar (1000m), 12.3. 1980, *K. Vivekananthan* 66202 (MH).

***Persea macrantha* (Nees) Kosterm.**

Wynad Forest Division, 11.2. 1982, *K.N. Subramanian* 7831 (IFGTB); Muthikulam, Olavacod Range, Palghat, 24.3. 1976, *K.N. Subramanian* 5772 (IFGTB); Kodassery water falls, Trichur (160 m), 23.1. 1982, *P. Bhargavan* 87493 (MH); Adirappilly RF, Trichur, 28.11. 1982, *B.D. Sharma* 43830 (MH); Sholayar, Malakkappara, Trichur, 5.2. 1984, *K. Ramamurthy* 80892 (MH); Panjanamkattu, Pornigal Range, Vazhachal, 19.12. 1984, *K.N. Subramanian* 10873 (IFGTB); Valava RF, Idukki, 7.2. 1984, *J.L. Ellis* 18567 (MH); Way to Moolamattam, Idukki, 18.2. 1982, Vallakadavu, Idukki, 13.12. 1983, *K.N. Subramanian* 9907 (IFGTB); XS. *Ramachandran* 61392 (MH); Way to Pamba, Moozhiar, Pathanamthitta (600 m), 15.6. 1988, *C.N. Mohanan* 72491 (MH); Pamba, Pathanamthitta, 26.3. 1978, *C.N. Mohanan* 73247 (MH); Kulathupuzha, Rockwood road, Thenmala, 20.12. 1975, *K.N. Subramanian* 5772 (IFGTB).

***Phyllanthus emblica* L.**

Thaliparamba farm, Malabar (Dt.), 14.2. 1913, *C.A. Barber* 8738 (MH); Sappal hill, Dhoni RF, Palghat (250m), 21.10. 1963, *J. Joseph* 17823 (MH); Attappadi RF, Palghat (825m), 12.10. 1965, *E. Vajravelu* 26195 (MH); Mukkali forest, Palghat (450m), 14.7. 1969, *E. Vajravelu* 32079 (MH); Ayyappankovil area, Palghat (950m), 4.3. 1975, *E. Vajravelu* 46174 (MH); Parambikulam submergible area, Trichur (607m), 7.4. 1963, *K. Ramamurthy* 16148 (MH); Kannamkuzhi, Trichur (100m), 12.9. 1976, *K. Ramamurthy* 48458 (MH); Ranni RF, Pathanamthitta (300m), 17.5. 1980, *C.N. Mohanan* 65073 (MH); Forest between Bonaccord and Vithura (525m), 22.8. 1975, *J. Joseph* 46480 (MH).

***Piper longum* L.**

Aralam farm, Cannanore (225m), 26.2. 1979, *V.S. Ramachandran* 61924

(MH); On the way of Paneth, Cannanore (500m), 13. 11. 1978, V.S. Ramachandran 58705 (MH); Sreekantapuram, Cannanore (350m), 22. 12. 1980, R. Ansari 69968 (MH); Panathur, Cannanore (500m), 10. 10. 1979, R. Ansari 64852 (MH); Thiruvizhamkunnu, Palghat (100m), 27. 12. 1969, E. Vajravelu 33372 (MH); Sirunelli estate (650m), 3. 11. 1976, E. Vajravelu 48844 (MH); Chindaki forest, Palghat (725m), 9. 11. 1976, E. Vajravelu 48903 (MH); Mukkali forest, Palghat (150m), 15. 10. 1965, E. Vajravelu 26277 (MH); Near Guruvayur, Trichur (10m), 6. 9. 1976, K. Ramamurthy 47644 (MH); Thundathil range, Ernakulam, 23.8. 1965, K.M. Sebastine 25369 (MH); Periar nursery on the river bed, 13. 2. 1964, K.N. Subramanian 1074 (IFGTB); Nagarampara RF, Idukki, 17. 9. 1982, K.N. Subramanian 8688 (IFGTB); Thekkuthode, Pathanamthitta (70m), 29. 4. 1988, N. Anil Kumar 610 (MH); Anjanakoppam, Azhutha river bank, Ranni Forest Division, 12.7. 1978, K.N. Subramanian 7303 (IFGTB); Kandankayam, Erumeli range, Ranni Forest Division, 14. 9. 1982, K.N. Subramanian 8620 (IFGTB); Achankovil RF, Konni Forest Division, 19. 1. 1983, K.N. Subramanian 8916 (IFGTB); Teak Plantation, Konni, 15. 12. 1994, T.F. Bourdillon 449 (MH); Palaruvi, Quilon (500m), 18. 12. 1978, C.N. Mohanan 59520 (MH); Valiakavu, Ranni (350m), 1. 9. 1977, N.C. Nair 50772 (MH); Travancore, 22. 10. 1904, C.A. Barber 6656 (MH).

### ***Piper nigrum* L.**

Karimbam, Cannanore, 23.6. 1980, R. Ansari 67809 (MH); Thaliparamba, Cannanore, Oct. 1905, C.A. Barber 3111 (MH); Wynad, Meppady, 3.8. 1905, C.N. Barber 2975 (MH); Sulthan Battery, Wynad, 8. 2. 1964, J.L. Ellis 18595 (MH); Kuttiyadi, Submergible area, Calicut, 23.6. 1965, B.D. Naithani 24170 (MH); Devikulam - Kumily road, Idukki, 23. 3. 1980, K. Ramamurthy 66323 (MH); Anathodu, Idukki, 7. 10. 1983, A.G. Pandurangann 79287 (MH); Kalvery mountains, Idukki, 11. 11. 1951, B. Ramanujam 72460 (MH); Thekkady, 28.9. 1972, B.D. Sharma 42077 (MH); Umayarmalai, Kottayam, 17. 11. 1965, B.V. Shetty 26490 (MH); Nalu-kadi, Changanassery, Kottayam, 28. 4. 1984, V.T. Antony 419 (MH); Kodumon, Quilon, 13. 8. 1978, C.N. Mohanan 58477 (MH).

### ***Plumbago zeylanica* L.**

Tolpetty, Cannanore, 8. 7. 1979, V.S. Ramachandran 54195 (MH); Sreekantapuram, Cannanore (200 m), 24. 6. 1980, R. Ansari 67829 (MH); On the way to railway station, Tellicherry, 18. 11. 1977, V.S. Ramachandraiz 52217 (MH); Tirunelli, Cannanore (800 m), 5. 3. 1979, V.S. Ramachandran 62121 (MH); Road side, Malampuzha Dam, Palghat (100 m), 15. 7. 1963, J. Joseph 17159 (MH); Dhoni RF, Palghat (75 m), 23. 10. 1963, J. Joseph 17857 (MH); Anakkatti, Palghat (200 m), 22. 9. 1977, R. Ansari 51447 (MH); Way to Kathalakundi, Palghat (800 m), 24. 2. 1979, E. Vajravelu

60645 (MH); Kawdikal, Palghat (550 m), 11. 11. 1976, *E. Vajaravelu* 48917 (MH); Walayar, Palghat, 1. 7. 1977, *K.N. Subramanian* 6791 (IFGTB); Varalapadi, Walayar, 18. 9. 1975, *K.N. Subramanian* 5346 (IFGTB); Walayar germplasm bank, Palghat, 6. 7. 1974, *K.N. Subramanian* 4978 (IFGTB); Arukutty, Vembanad Lake, Alleppy, 30. 12. 1990, *M.S. Swaminathan* 95675 (MH); Kumily to Thekkady, Kottayam (675 m), 26. 11. 1967, *K. Vivekananthan* 29372 (MH).

***Pongamia pinnata* (L.) Pierr.**

Olavara, Kasaragod (200 m), 12. 5. 1982, *R. Ansari* 73858 (MH); Near Vadakkanchery, Trichur (50 m), 10. 9. 1976, *K. Ramamurthy* 48443 (MH); Sides of Chalakkudy river (300 m), 16. 3. 1982, *R. Rajan* 73037 (MH); Kalamkunnu, Anchal range, West bank of Kulathupuzha river, Thenmala, 9. 3. 1975, *K. N. Subramanian* 5139 (IFGTB); Arambathode, Travancore, 6. 11. 1928, *V Narayanaswami* 1301 (MH).

***Pseudarthria viscida* (L.) Wt. et Arn.**

On the way to Periya, Nedumpoil, Cannanore (550m), 27. 2. 1979, *V.S. Ramachandran* 61955 (MH); Kanoth RF, Kannavam, Cannanore (175m), 17. 2. 1978, *V.S. Ramachandran* 54020 (MH); Ambayathode, Cannanore (550M), 15. 12. 1979, *V.S. Ramachandran* 65232 (MH); On the way to Panoth, Cannanore (550M), 13. 11. 1978, *V.S. Ramachandran* 58709 (MH); Mukkali Forest (550m), 11. 10. 1979, *N.C. Nair* 64524 (MH); Kanjirampuzha submergible area, Palghat (1500m), 26. 10. 1964, *K.M. Sebastine* 21094 (MH); Sappal Hill, Dhoni RF, Palghat (250m), 21. 10. 1963, *J. Joseph* 17764 (MH); Parambikulam submergible area, Palghat (1240m), 22. 11. 1962, *K.M. Sebastine* 15304 (MH); On the way to Nellikutha, Nilambur range, Nilambur Forest Division, 27. 12. 1983, *N. Venketasubramanian* 10151 (IFGTB); Kanjar, Idukki, 7. 12. 1982, *V.S. Ramamurthy* 74951 (MH); Sholayar-Malikkampara route, Trichur (1175m), 5. 2. 1984, *K. Ramamurthy* 72798 (MH); Adirappally RF, Trichur (100m), 23. 11. 1941, *K.M. Sebastine* 26727 (MH); Thekkuthode, Pathanamthitta, 19. 12. 1987, *N. Anilkumar* 208 (MH); Adoor, Quilon (125m), 14. 11. 1979, *C.N. Mohanan* 68307 (MH); Achencoil, Thorai, Travancore 8. 10. 1978, *V. Narayanaswami* 784 (MH); Ayurvedic College, Trivandrum, 23. 11. 1941, *K. Cherian Jacob* 20174 (MH); Aickad, Kallar, Trivandrum (250m), 18. 11. 1977, *C.N. Mohanan* 52372 (MH).

***Pseudoxylanthera bourdillonii* (Gamble) Naith.**

Travancore, 29. 8. 1934, *T.F. Bourdillon* 89 (MH).

***Pseudoxynanthera ritcheyi* (Munro) Naith.**

Panathur, Cannanore (350m), 28. 1. 1979, *V.J.Nuir* 59948 (MH); Panathady RF, Cannanore (350m), 28. 1. 1979, *KS. Ramachundrun* 59291 (MH).

***Pterocarpus marsupium* Roxb.**

Beemanadi, Kasargod District, 27. 9. 1982, *R. Ansari* 74351 (MH); Thaliparamba farm, Cannanore, 14. 2. 1930, *C.A. Barber* 8700 (MH); Chedaleth, Wynad, 20. 8. 1964, *J.L. Ellis* 20500 (MH); PP Malavaram Range, Calicut Division, 23. 6. 1988, *K.K.N. Nuir* 6362 (KFRI); Walayar, Palghat Division, Aug. 1932, *Mimuddin s.n.* (IFGTB Acc. No. 2168); Walayar, Palghat Division, Aug. 1932, *N. Velayudhan Nair s.n.* (IFGTB Acc. No. 2165); Above Eswaran Estate, Palghat Division, 23. 4. 1977, *E. Vujruvelu* 49750 (MH); Attappady RF, Palghat, 12. 10. 1965, *E. Vujruvelu* 26196 (MH); Chindaki, Palghat Division, 16. 10. 1979, *N.C. Nuir* 64673 (MH); Poopara, Rajakad, Munnar Division, 17. 5. 1988, *K.K.N. Nuir* 6331 (KFRI); Santhanpara, Kottayam District, 21. 4. 1964, *K.M. Sebastine* 18360 (MH); Thannikudi, Thekkady, Idukki District, 20. 10. 1972, *B.D. Sharma* 42382 (MH); Rajampara, Ranni Range, Ranni Division, 29. 3. 1989, *K.K.N. Nuir* 6367 (KFRI); Kallar, Travancore, 6. 11. 1928, *K Narayanaswamy* 77825 (MH); Mangode, Paruthipilly Range, Trivandrum, 10. 7. 1978, *K.N. Subrananian* 7238 (IFGTB); Forests between Vithura and Bonacaud, Trivandrum, 22. 8. 1975, *J. Joseph* 46477 (MH); Ponmudi, Trivandrum District, 11. 6. 1976, *C.E. Ridsdale* 129 (MH); Kottur RF, Paruthipilly Range, Trivandrum Division, 1. 1. 1988, *K.K.N. Nuir* 6311 (KFRI).

***Raphidophora pertusa* (Roxb.) Schott**

Chandanathodu, Cannanore (675 m), 4.11.1965, *J.L. Ellis* 26424 (MH); Nedumpoyil, Cannanore (550 m), 12.12.1979, *KS. Ramachandran* 68241 (MH); Calicut, Madras, 30.1.1929, *D. Pruin s.n.* (MH); Karapara river side, Palghat (900 m), 16.4.1977, *E. Vajravelu* 48979 (MH); Karapara, Palghat (900 m), 29.10.1976, *E. Vajravelu* 48752 (MH); Panamkutty, Idukki (600 m), 17.10.1982, *C.N. Mohanan* 74639 (MH); Panamkutty, Idukki (600 m), 7.10.1983, *A.G. Pandurangan* 79282 (MH); Triveny, Idukki (650 m), *B.D. Shurma* 42456 (MH).

***Rauwolfia serpentina* (L.) Benth. ex Kurz**

Kutiyadi submergible area (190m), 28. 6. 1965, *Nuithani* 24671 (MH); Thaliparamba, North Malabar (150), *K Narayanaswami* 9 (MH); Kannothe, Malabar, 11. 12. 1913, *Without coll. name* 9563 (MH); Walayar, Malabar, 27. 7. 1939, *S.R. Raja* 18629 (MH); Chedaleth, Calicut (900m), 13. 8. 1964, *J.L. Ellis* 1970 (MH); Pavagadha, Calicut (725m), 12. 5. 1965, *J.L. Ellis* 24082 (MH); Walayar, Palghat Division, *K.N. Subramanian* 4984 (IFGTB); Mukkali forest rest house area, Palghat (550m), 9. 10. 1979, *N.C. Nuir* 64448

(MH); Vazhachal teak plantation near Rest House, 9. 7. 1985, *K.N. Subramanian* 11146 (IFGTB); Pamba Valley, Idukki (275m), 22. 3. 1973, *B.D. Sharma* 24671 (MH); Manimala, Kottayam (175m), 13.2. 1984, *V.T. Antony* 293 (MH); Kuravamperur RF, Ranni, 18. 4. 1982, *K.N. Subramanian* 8239 (IFGTB); Koruthodu, Ranni Forest Division, 14. 9. 1982, *K.N. Subramanian* 8590 (IFGTB); Konni RF, Quilon, 20. 4. 1984, *E. Vajravelu* 80538 (MH); Kulathupuzha, Quilon (250m), 18. 5. 1978, *M. Mohanan* 54834 (MH); Thekkuthode, Quilon (200m), 9. 4. 1978, *C.N. Mohanan* 54981 (MH); Achenkovil RF, Quilon (350m), 29.5. 1979, *C.N. Mohanan* 61282 (MH); Way to Palapally, Quilon (200m), 23. 2. 1979, *C.N. Mohanan* 61177 (MH); Perunthenaruvi, Quilon (300m), 25. 7. 1979, *C.N. Mohanan* 63464 (MH); Thenmala, Quilon (380m), 18. 5. 1978, *M. Mohanan* 54861 (MH).

### ***Rotula aquatica* Lour.**

Poovam-cholai, Silent valley (1000m), 7. 3. 1984, *N.C. Nair* 81125 (MH); Bhavani river bank, Silent valley, Palghat (500m), 27. 8. 1966, *E. Vajravelu* 27840 (MH); Nedumkayam, Nilambur, Malappuram (650m), 14.3. 1984, *N.C. Nair* 81233 (MH); Bhootvara, Athirapally, Trichur (175m), 13.2. 1970, *B.V. Shetty* 33501 (MH); Pooyamkutty, Idukki (150m), 13.12.1988, *P. Bhurgavan* 87486 (MH); Panamkutty, Idukki (400m), 19. 12. 1982, *C.N. Mohanan* 76203 (MH); Cheruthoni, Idukki (400m), 16. 2. 1982, *C.N. Mohanan* 73303 (MH); Adukkam, Changanassery (27m), 14. 3. 1985, *V.T. Antony* 1148 (MH).

### ***Rubia cordifolia* L.**

Tholpetty Village, Cannanore, 20. 11. 1977, *KS. Ramachandran* 52293 (MH); Hill side RF, Begur, Wynad, 23. 11. 1983, *K.N. Subramanian* 9765 (IFGTB); Kumbamala, KFDC tea plantations, Wynad, 22. 11. 1983, *K.N. Subramanian* 9704 (IFGTB); Manantody-Kuthuparamba Road, Wynad, 11. 2. 1982, *K.N. Subramanian* 7849 (IFGTB); Panthanthodu, Mukkali, Palghat, 30. 8. 1983, *K.N. Subramanian* 9494 (IFGTB); Kuppadi, Sultan's Battery, Calicut (890m), 6.2. 1964, *J.L. Ellis* 18548 (MH); Pambara Estate, Calicut (900m), 27. 10. 1965, *J.L. Ellis* 25720 (MH); Chindaki forest, Palghat (575m), 12. 1. 1980, *N.C. Nair* 65423 (MH); Panthanthode, Palghat (825m), 18. 12. 1969, *E. Vajravelu* 33096 (MH); Kaikkatty Orange farm, Nelliampathy, Trichur (1000m), 20. 11. 1962, *E. Vajravelu* 44749 (MH); Parambikulam submergible area, Trichur (1240m), 20. 11. 1962, *K.M. Sebastine* 15046 (MH); Kattapana, Idukki (925m), 27. 9. 1981, *C.N. Mohanan* 72039 (MH); Kalvery mount, Idukki (1200m), 8. 11. 1981, *C.N. Mohanan* 72431 (MH); Umaiya mala, Devicolam, Idukki (2150m), 19. 4. 1966, *B.V. Shetty* 27337 (MH). Kozhikanam, Idukki (1000m), 25. 12. 1974, *B.D. Sharma* 41639 (MH); Kumily, Idukki (825m), 25. 12. 1974, *K. Vivekananthan* 48621 (MH); Thekkady, Kottayam (875m), 8. 10. 1976, *K. Vivekananthan* 48621 (MH); Vallakadavu, Eucalyptus plantation, 14. 7.

1983, *K.N. Subramanian* 9431 (IFGTB); Pamba to Vandiperiyar, Kottayam (1025m), 28.6. 1968, *D.B. Deb* 30457 (MH).

***Samadera indica* Gaertn.**

Kannothe RF (1140m), 26.4. 1979, *V.S. Ramachandran* 61603 (MH); Ponnany, Malabar, *Without coll. name & no* (Acc. No. 8629, (MH)); Peria RF, Wynad Division, 10.2. 1982, *K.N. Subramanian* 7825 (IFGTB); Dhoni RF, Palghat (75m), 26. 5. 1964, *E. Vajravelu* 19076 (MH); Dhoni, Olavakode range, Palghat, 26. 4. 1966, *K.N. Subramanian* 2504 (IFGTB); Vellangallur to Kodumgallur, Trichur (50m), 15.4. 1977, *K. Ramamurthy* 49349 (MH); Quilon, sea level, 28. 12. 1978, *C.N. Mohanan* 59696 (MH); Kodumon, Quilon (195m), 25.5. 1978, *C.N. Mohanan* 55693 (MH); Thenmalai RF, Quilon (350m), 29. 5. 1979, *C.N. Mohanan* 63070 (MH).

***Santalum album* L.**

Kumbala, Cannanore (125m), 25. 1. 1979, *V.S. Ramachandran* 59228 (MH); Kumbala, Cannanore (50m), 25. 1. 1979, *V.J. Nair* 59875 (MH); Tolpetty, near forest rest house, Cannanore (810m), 22. 11. 1977, *V.S. Ramachandran* 52281 (MH); Karimbam, Cannanore (200m), 25.6. 1980, *R. Ansari* 67842 (MH); Ehuvala, Cannanore (175m), 17.12.1979, *V.S. Ramachandran* 65273 (MH); Dhoni RF, Palghat (100m), 18.7.1963, *J. Joseph* 17184 (MH); Thunbermuzhi forest, Trichur (200m), 18. 3. 1982, *R. Rajan* 73058 (MH); Chalakkudy, Trichur (100m), 18. 7. 1966, *K.M. Sebastine* 27501 (MH); Mariyur, Kottayam (1000m), 18.6.1963, *K.M. Sebastine* 16553 (MH); Adukkam, Kottayam (400m), 15. 1. 1985, *V.T. Antony* 1104 (MH); Kulathupuzha, Quilon (225m), 8.6. 1979, *C.N. Mohanan* 63139 (MH); Quilon (sea level), 22. 12. 1979, *C.N. Mohanan* 65014 (MH); Aryankavu, Quilon (500m), 21.12. 1978, *C.N. Mohanan* 59587 (MH); Trivandrum (125m), 4.12.1977, *M. Mohanan* 52755 (MH); Poojappura, Trivandrum, 1. 10. 1981, *N.C. Nair* 62529 (MH).

***Sapindus trifoliata* L.**

Mukkali forest, Palghat (525m), 23. 12. 1969, *E. Vajravelu* 33316 (MH); Panthanthode, Palghat (700m), 19. 12. 1969, *E. Vajravelu* 31144 (MH); Mukkali slopes, Palghat (500m), 23. 2. 1979, *E. Vajravelu* 60632 (MH); Pothundi to Kaikatty, Nemmara (450m), 21. 11. 1973, *E. Vajravelu* 44737 (MH); Thunbermuzhi forest, Trichur (200m), 18. 3. 1982, *R. Rajan* 73954 (MH); Mundakayam, Kottayam (75m), 27.8.1984, *V.T. Antony* 660 (MH); Adukkam, Kottayam (400m), 19. 11. 1984, *Rev. Fr. Kadavil* 1023 (MH); Achencoil, Mannarappuzha, Pathanamthitta (250m), 16. 1. 1989, *N. Anilkumar* 1413 (MH); Thenmala Forest Division, near Kallada dam, 17. 12. 1975, *K.N. Subramanian* 5617 (IFGTB); Old Courtallum, Arienkave (650m), 19. 12. 1978, *C.N. Mohanan* 59545 (MH).

***Saraca asoca* (Roxb.) Wilde**

Brumhagiri (950m), Wynad, 4. 3. 1979, *V.S. Ramachandran* 62058 (MH); Nedumpoil(75m), Cannanore, 19.2. 1978, *V.S. Ramachandran* 54081 (MH); Dhoni, Olavacod, Palghat 26. 4. 1966, *K.N. Subramanian* 2500 (MH); Marappalam, Palghat (575m), 18.4. 1977, *E. Vajravelu* 48992 (MH); Pothundi to Kaikatti, 24.2. 1975, *E. Vajravelu* 45725 (MH); Changanassery, 16.2. 1984, *V.T. Antony* 300 (MH); Kulamavu, Idukki, 25.9. 1984, *C.N. Mohanan* 80190 (MH); Chittipara, Pathanamthitta (300m), 26.2. 1979, *C.N. Mohanan* 61165 (MH); Kulathupuzha RF., Quilon, (225m), 13.2. 1979, *C.N. Mohanan* 61165 (MH); Achencoil RF, (500m), 28. 5. 1979, *C.N. Mohanan* 63061 (MH); Pulimath, Trivandrum (125m), 27.5. 1979, *M. Mohanan* 63300 (MH).

***Sarcostemma acidum* (Roxb.) Voigt**

Travancore, 1837, *Robert Wight* 2230 (MH)

***Sarcostigma kleinii* Wt. et Arn.**

Muthikulam, Palghat, 26. 4. 1982, *S. Chand Basha* 8287 (IFGTB); Valara Water falls, Idukki (1800m), 19. 3. 1982, *R. Rajan* 73083 (MH); Ranni to Manniyar canal (150m), 28. 11. 1976, *M. Chandrabose* 49219 (MH); Ranni Forest Division, 25. 2. 1983, *N. Venkatasubramanian & K.R. Sasidharan* 9224 (IFGTB); Valiyakavu RF, Ranni Division, 22. 2. 1983, *N. Venkatasubramanian & K.R. Sasidharan* 9065 (IFGTB); Thora, Mannarappara, Konni Division, 19. 4. 1982, *K.N. Subramanian* 8257 (IFGTB); Quilon, 18. 12. 1914, *T.F. Bourdillon* 454 (MH); Mamoodu 1st bridge, Thenmala range, Thenmala Division, 6. 3. 1975, *K.N. Subramanian* 5046 (IFGTB); Kulathupuzha, Rockwood road, Thenmala, 20. 12. 1975, *Without coll. name* 5762 (IFGTB); Arienkavu, Quilon 20. 1. 1894, *T.F. Bourdillon* 19 (MH); Alappad-Achenkovil, Quilon (400m), 23. 5. 1979, *C.N. Mohanan* 63036 (MH); Ponmudi, Hill Opposite to T.B. (875m), 28. 11. 1979, *M. Mohanan* 52560 (MH); Pulimath, Trivandrum (125m), 2. 12. 1977, *M. Mohanan* 52656 (MH); Kottur RF, Trivandrum (200m), 8. 4. 1973, *J. Joseph* 44108 (MH); Manmedu, Travancore, 9. 11. 1928, *V. Narayanaswami* 1452 (MH).

***Schizostachyum beddomei* (Fisch.) Majum.**

Rajamalai, Fifth mile, Munnar, 28. 1. 1996, *Muktesh kumar and Stephen* 7246 (KFRI).

***Schleichera oleosa* (Lour.) Oken**

Begur RF, Cannanore (825m), 22. 3. 1980, (825m), 22. 3. 1980, *V.S. Ramachandran* 66849 (MH); Trissleri, Begur RF, Cannanore (825m), 5. 5. 1979, *V.S. Ramachandran* 62271 (MH); Sultan's Battery, Calicut (890m), 9. 5. 1965, *J.L. Ellis* 24024 (MH); Kuppadi, Calicut (900m), 19. 8. 1964, *J.L.*

*Ellis* 20489 (MH); Pavagada, Calicut (900m), 13.2. 1964, *J.L. Ellis* 18687 (MH); Manchery, Malapuram (225m), 28. 2. 1970, *J.L. Ellis* 33616 (MH); Kadunnakappu, Malapuram (650m), 14. 3. 1984, *N.C. Nair* 81245 (MH); Walayar, Palghat Division, 21. 9. 1937, *S.R. Umbarje* s. n. (IFGTB); Kurisumala, Malayattoor RF, Ernakulam (250m), 14. 2. 1970, *B.V. Shetty* 33510 (MH); Panamkutty, Idukki (400m), 22. 2. 1983, *C.N. Mohanan* 77945 (MH); Kulamavu, Idukki (700m), 1. 6. 1982, *V.S. Ramachandran* 74125 (MH); Vazhappally, Changanachery, 7. 2. 1985, *V.T Antony* 1119 (MH); Pamba river bank, Sabarimala RF, Pathanamthitta, 28. 4. 1984, *E. Vajravelu* 80632 (MH); Ranni RF, 14. 9. 1982, *K.N. Subramanian* 8611 (IFGTB); Kumarampuzha RF, Konni, 18.4. 1982, *K.N. Subramanian* 8240 (IFGTB); Mammude 1st bridge, Thenmala Range, 6. 3. 1975, *K.N. Subramanian* 5022 (IFGTB); Southern side of Kulathupuzha, Thenmala, 24. 4. 1978, *K.N. Subramanian* 7307 (IFGTB); Thenmala, Forest Division, 23.2. 1980, *P. Farooqui* and *N. Venketasubramanian* 168 (IFGTB); Kottur RF, Trivandrum Forest Division, 11. 2. 1981, *P. Farooqui* and *N. Ventasubramanian* 265 (IFGTB).

***Semecarpus anacardium* L. f.**

Way to Dhoni RF, Palghat (100m), 26. 5. 1964, *E. Vajravelu* 19092 (MH); Attappadi block, Palghat (450m), 27. 8. 1966, *E. Vajravelu* 27858 (MH); Mukkali slopes, Palghat (925m), 13. 1. 1979, *E. Vajravelu* 59136 (MH); Meenmutty, Kulamavu, Idukki (700m), 24. 1. 1983, *A.G. Pandurangan* 76610 (MH); Chuttipara hills, Pathanamthitta (300m), 26. 2. 1979, *C.N. Mohanan* 61217 (MH); Konni RF, Quilon (300m), 20. 5. 1980, *C.N. Mohanan* 68381 (MH); Yeroor RF, Punalur Forest Division, 4. 3. 1982, *K.N. Subramanian* & *N. Venketasubramanian* 8026 (IFGTB); Kalam-kunnu, Thenmala range, Thenmala Division, 14. 7. 1978, *K.N. Subramanian* 7369 (IFGTB); Achenkovil RF, Quilon (400m), 28. 5. 1979, *C.N. Mohanan* 63046 (MH); Changanachery, 18. 11. 1985, *V.T Antony* 996 (MH); Kottur RF (250m), 27. 8. 1975, *J. Joseph* 46529 (MH); Kottur RF, Trivandrum Division, 8. 8. 1985, *N. Venketasubramanian* & *K.R. Sidharthan* 11273 (IFGTB).

***Sida acuta* L.**

Glarara, Kasaragod, 12. 5. 1982, *V.J. Nair* 73867 (MH); Thaliparamba, Cannanore, 23. 9. 1982, *R. Ansari* 73974 (MH); Tholpetty, Wynad, 8. 7. 1978, *V.S. Ramachandran* 54182 (MH); Kabani falls, Calicut, 17. 8. 1964, *J.L. Ellis* 20455 (MH); Malleswaram temple, Chemmannur, Palghat, 14. 10. 1979, *N.C. Nair* 64626 (MH); Olavacod, Palghat, 16. 10. 1963, *J. Joseph* 17721 (MH); Sholayar, Trichur, 5. 2. 1984, *K. Ramamurthy* 80848 (MH); Near Guruvayoor, Trichur, 6. 9. 1976, *K. Ramamurthy* 47647 (MH); Kodungallor to Irinjalakuda, Trichur, 25. 9. 1982, *K. Ramamurthy* 74836



(MH); Meenmutti, Idukki, 2.10.1983, *C.N. Mohanan* 79901 (MH); Sabarimala, Idukki, 27. 9. 1972, *B.D. Sharma* 42044 (MH); Marayur, Munnar, Idukki, 18.6.1963, *K.M. Sebastine* 16552 (MH); Chingavanam, Kottayam, 27.4.1984, *V.T. Antony* 412 (MH); Changanassery, Kottayam, 30. 12. 1983, *V.T. Antony* 52 (MH); Punnamada, Alleppy, 28. 12. 1990, *M.S. Swaminathan* 95608; Ochira, Quilon, 10. 12. 1979, *C.N. Mohanan* 63724 (MH); Achenkovil valley, Quilon, 7. 10. 1928, *V. Narayanaswamy* 750 (MH).

***Sida cordata* (Burm.f.) Bross.**

Kuthuparambu, Cannanore, 20. 3. 1930, *Without coll. name* 9241 (MH); Olavacod, Palghat, 17. 10. 1963, *J. Joseph* 17760 (MH); Kanjirampuzha, Palghat, 26. 10. 1964, *K.M. Sebastine* 21086 (MH); Peechi range, Trichur, 4. 9. 1976, *K. Ramamurthy* 47620 (MH); Pothuchadi, Peechi, 23. 5. 1966, *K.M. Sebastine* 27660 (MH); Cochin, 1. 10. 1957, *P.J. Johny* 94170 (MH); Kulathur, Kottayam, 14. 1. 1984, *V.T. Antony* 179 (MH); Arukutty, Aleppy, 30. 12. 1990, *M.S. Swaminathan* 95682 (MH); Kallar, Trivandrum, 22. 11. 1979, *M. Mohanan* 65160 (MH); Kovalam, Trivandrum, 16. 11. 1979, *M. Mohanan* 63897 (MH).

***Sida cordifolia* L.**

Pappanissery, Cannanore, 4. 10. 1979, *R. Ansari* 64706 (MH); Kannothe, Cannanore, December, 1930, *Without coll. name* 16914 (MH); Payyannur, Cannanore, 25. 9. 1982, *R. Ansari* 74303 (MH); Calicut, Malabar, 11. 12. 1931, *G.V. Narayana* 81689 (MH); Walayar dam, Palghat, 25. 10. 1963, *J. Joseph* 17875 (MH); Chavakkad, Trichur, 10. 2. 1984, *K. Ramamurthy* 80456 (MH); Kodungallore to Irinjalakuda, Trichur, 25. 9. 1982, *K. Ramamurthy* 74822 (MH); Vattappally, Changanassery, 10. 1. 1984, *V.T. Antony* 127 (MH); Punnamada, Alleppy, 16. 4. 1988, *M.S. Swaminathan* 88206 (MH); Paravur, Quilon, 28. 12. 1978, *C.N. Mohanan* 59688 (MH); Kodumon, Quilon, 15. 4. 1978, *C.N. Mohanan* 55511 (MH); Overbridge Junction, Trivandrum, 20. 3. 1978, *M. Mohanan* 54717 (MH).

***Sida rhombifolia* L.**

Pavagadha, Cannanore, 28. 10. 1965, *J.L. Ellis* 25755 (MH); Kannothe, Cannanore, 3. 11. 1978, *V.S. Ramachandran* 57700 (MH); Chandanathodu, Wynad, 4. 12. 1967, *J.L. Ellis* 29438 (MH); Kanjirampuzha, Palghat, 26. 10. 1964, *K.M. Sebastine* 21092 (MH); Way to Valiyaparathodu, Silent Valley, Palghat, 7. 10. 1979, *N.C. Nair* 64374 (MH); Athirappilly, Trichur, 27. 11. 1982, *K. Ramamurthy* 75587 (MH); Kozhikanam, Idukki, 3. 10. 1976, *K. Vivekananthan* 48577 (MH); Kulamavu, Idukki, 23. 9. 1984, *C.V. Mohanan* 80150 (MH); Tholnada, Pooyamkutty, Idukki, 14. 12. 1988, *P. Bhargavan* 89908 (MH); Changanassery, 4.2.1984, *V.T. Antony* 257 (MH); Rajampara, Pathanamthitta, 20. 9. 1988, *N. Anilkumar* 883 (MH); Upper

Moozhiar, Pathanamthitta, 25. 11. 1988, *N. Anilkumar* 1157 (MH); Kottarakkara, Quilon, 14. 11. 1979, *C.N. Mohanan* 68308 (MH); Bonacaud, Trivandrurn, 22. 3.1978, *M. Mohanan* 54732 (MH); Ponmudi slopes, Trivandrum, 17. 11. 1977, *M. Mohanan* 52542 (MH).

***Sida spinosa* L.**

Palghat hills, 23. 12. 1923, *Without coll. name* 17297 (MH).

***Solanum violaceum* Ortega**

Thirunelli, Cannanore, 6. 3. 1979, *V.S. Ramachandran* 62156 (MH); Kannothe, Malabar Dt., 13. 12. 1913, *Without cull. name* 9604 (MH); Chandanathodu, Cannanore, 1. 5. 1979, *V.S. Ramachandran* 61671 (MH); Tholpetty, Cannanore, 8. 7. 1978, *V.S. Ramachandran* 54193 (MH); Tholpetty, Cannanore, 24. 11. 1977, *V.S. Ramachandran* 52352 (MH); Makkicheravattam, Cannanore, 5. 12. 1967, *J.L. Ellis* 29496 (MH); Kuttiyadi submergible area, Calicut, 27. 6. 1965, *B.D. Naithani* 24666 (MH); Attappady, Palghat, 20. 12. 1969, *E. Vajravelu* 33178 (MH); Anavai, Palghat, 28. 4. 1977, *E. Vajravelu* 49813 (MH); Silent Valley, Palghat (675 m), 11. 12. 1980, *N.G. Nair* 1362 (KFRI); Silent Valley RF, Palghat, 22. 4. 1980, *V.J. Nair* 67255 (MH); Muthikulam RF, Palghat, 30. 5. 1979, *Vajravelu* 62898 (MH); Devikolarn, Idukki, 11. 9. 1968, *D.B. Deb* 30725 (MH); Ayyappan temple area, Idukki, 15. 12. 1981, *N.C. Nair* 70195 (MH); Thekkady, Idukki, 6. 10. 1972, *B.D. Sharma* 42430 (MH); Aruvikkad, Munnar (1700 m), 27. 11. 1979, *V.P.K.Nambiar* 898 (KFRI); Rockwood, Thenmala Forest Division, 3. 6. 1964, *K.N. Subramanian* 1552 (IFGTB).

***Sterculia urens* Roxb.**

South Malabar, 13. 12. 1914, *C.E.C. Fischer* 11442 (MH); Walayar RF, 26. 10. 1963, *J. Joseph* 17885 (MH); Dhoni, Palghat Division, 21. 1. 1910, *C.E.C. Fischer* 1642 (IFGTB); Pathanthode, Palghat (700m), 19. 12. 1969, *E. Vajravelu* 33167 (MH); Agali Forest, Palghat (575m), 17. 10. 1965, *E. Vajravelu* 26304 (MH); Kurisumala, Malayattoor RF (250m), 14. 2. 1970, *B.V. Shetty* 33509 (MH); Vallakadavu, 1965 Eucalyptus plantation, 15. 7. 1983, *K.N. Subramanian* 9473 (IFGTB).

***Sterculia villosa* Roxb. ex DC.**

Dhoni, 4. 1. 1807, *T.F. Bourdillon* 905 (IFGTB); Cheruthony, Idukki, 19. 2. 1983, *C.N. Mohanan* 76255 (MH); Kulamavu, Idukki (700m), 14. 12. 1982, *C.N. Mohanan* 76060 (MH); Way to Mamalakandam, Idukki (300m), 26. 12. 1988, *P. Bhargavan* 90099 (MH); Kottampara, Travancore (1700m), 15. 11. 1928, *V. Narayanaswami* 1619 (MH); Way to Agastyarkudam, Trivandrum (1300m), 20.2. 1979, *M. Mohanan* 59329 (MH).

***Stereospermum colais* (Buch.-Ham. ex Dillw.) Mabber.**

Thirunelli RF, Begur range, Wynad, 23. 11. 1983, *K.N. Subramanian* 8255 (IFGTB); Thaliparamba farm, Malabar, 19. 5. 1906, *C.A. Barber* 7778 (MH); Kannothe, Malabar Dt., 9. 12. 1913, *Without coll. name* 9521 (MH); Walayar RF, near railway track, Palghat (85m), 23. 5. 1964, *E. Vajravelu* 19040 (MH); Chindaki forest, Palghat (650m), 1. 6. 1966, *E. Vajravelu* 27760 (MH); Below Anavai, Palghat (850m), 14. 4. 1978, *N.C. Nair* 56813 (MH); Panthanthode, Karivara (725m), 2. 5. 1980, *V.J. Nair* 67448 (MH); Vallakadavu, 1465 Eucalyptus plantation, 14. 7. 1983, *K.N. Subramanian* 9415 (IFGTB); Ranni, 22. 2. 1983, *N.P. Mahadevan, N. Venketasubramanian & K.R. Sasidharan* 9052 (IFGTB); Thora, Mannarappara Range, Konni, 19. 4. 1982, *K.N. Subramanian* 8255 (IFGTB); Kallar estate, Thenmala Division, 25. 4. 1976, *K.N. Subramanian* 6093 (IFGTB); Kottur RF, Trivandrum Division, 4. 5. 1979, *P. Farooqui & N. Venketasubramanian* 28 (IFGTB).

***Strychnos nux-vomica* L.**

Olavakkot, Palghat (75m), 16. 10. 1963, *J. Joseph* 17755 (MH); Near Olavakkod Camp house, Palghat (75m), 1. 6. 1964, *E. Vajravelu* 19150 (MH); Kanjirampuzha submergible area (1200m), 8. 3. 1965, *K.M. Sebastine* 22829 (MH); Panangotei, Palghat (150m), 2. 11. 1976, *E. Vajravelu* 4883 (MH); Vazhani, Trichur (125m), 2. 11. 1976, *K. Ramamurthy* 47639 (MH); Chalakkudy, Trichur (75m), 10. 2. 1984, *K. Ramamurthy* 80447 (MH); Karippanthodu, Konni RF, 21. 1. 1983, *K.N. Subramanian* 8985 (IFGTB); Plachery, Ranni RF, Quilon (350m), *C.N. Mohanan* 61216 (MH); Quilon, Travancore 25. 10. 1904, *Without coll. name* 6685 (MH).

***Strychnos potatorum* L.f.**

Walayar RF, Palghat (900m), 23. 5. 1964, *E. Vajravelu* 19044 (MH); Chinnar, Munnar Division, 25. 1. 1996, *K.K.N. Nair* 8317 (KFRI).

***Symplocos cochinchinensis* (Lour.) Moore subsp. *laurina* (Retz.) Nootb.**

Chandanathode, Cannanore (800m), 3. 11. 1965, *J. L. Ellis* 26368 (MH); Theerthundamalai, Chandanathode, Cannanore (775m), 9. 5. 14. 2. 1978, *V.S. Ramachandran* 53965 (MH); Chandanathode, Cannanore (930m), 26. 6. 1965, *J.L. Ellis* 25177 (MH); Way to Periya, Chandanathode (800m), 31. 10. 1965, *J.L. Ellis* 25777 (MH); Way to Manantody (900m), 24. 6. 1965, *J.L. Ellis* 25119 (MH); Chedaleth, Calicut (900m), 13. 8. 1964, *J.L. Ellis* 19965 (MH); Kunthipuzha to Poochippara, Palghat (950m), 10. 12. 1980, *N.C. Nair* 69183 (MH); Lower Walayar, Palghat (1200m), 30. 3. 1983, *N.C. Nair* 77259 (MH); Bank of Periyar, near Thannikudi (950m), 8. 2. 1987, *N.C. Nair* 70148 (MH); Kurisumala, Kottayam (900m), 12. 9. 1984, *V.T. Antony* 725 (MH); Puthukkulam, Pathanamthitta (75m), 7. 7. 1988, *N. Anilkumar* 649 (MH).

***Syzygium cumini* (L.) Skeels**

Kambamala, Begur Range, Wynad, 6. 5. 1983, *N. Venketasubratnanian* 9411 (IFGTB); Muthikulam, Olavacod, Palghat, 24. 3. 1976, *K.N. Subramanian* 5802; Meenmutty, Idukki (600m), 15. 2. 1982, *C.N. Mohanan* 73287 (MH); Panamkutty, Idukki (400m), 22. 2. 1983, *C.N. Mohanan* 77926 (MH); Changanassery, 2. 3. 1984, *V.T. Antony* 315 (MH); Vallakadavu, 1965 Eucalyptus plantation, 14. 7. 1983, *K.N. Subramanian* 9445 (IFGTB).

***Terminalia arjuna* (Roxb. ex DC.) Wt. et Arn.**

Tholpetty, Begur Range, Wynad (800m), 21. 11. 1977, *V.S. Ramachandan* 52260 (MH); Pamba estate, Calicut (900m), 13. 5. 1965, *J.L. Ellis* 24094 (MH); Mukkali, Palghat (650m), 29. 11. 1973, *E. Vajravelu* 44883 (MH); Mukkali, near Rest House, Palghat Division, 23. 9. 1977, *K.N. Subramanian* 7066 (IFGTB).

***Terminalia bellirica* (Gaertn.) Roxb.**

Mukkali, Palghat (675m), 27. 11. 1973, *E. Vajravelu* 44846 (MH); Panthanthode, Palghat (825m), 18. 12. 1969, *E. Vajravelu* 33135 (MH); Chindaki forest, Palghat (650m), 1. 6. 1966, *E. Vajravelu* 27763 (MH); Malampuzha Hill slopes, Palghat, (125m), 29. 5. 1964, *E. Vajravelu* 19115 (MH); Varadimalai, Palghat (1199m), 19. 4. 1978, *P. Bhargavan* 56898 (MH); Karivara, Attappadi range, Palghat, 20. 9. 1977, *K.N. Subramanian* 7030 (IFGTB); Thavalam, Palghat (600m), 11. 3. 1975, *E. Vajravelu* 46277 (MH); Adivaram, Near bamboo plot, 13. 2. 1964, *K.N. Subramanian* 1090 (IFGTB); Nilambur, Nov. 1932, *Tiwari s.n.* (IFGTB); Vallakadavu, 1965 Eucalyptus plantation, 13. 12. 1983, *K.N. Subramanian* 9938 (IFGTB).

***Terminalia chebula* Retz.**

Okkara, Thekkadi, Kottayam (850m), 29. 9. 1972, *B.D. Sharma* 42364; Way to Mangala Devi Temple, Idukki (1005m), 10. 10. 1976, *K. Vivekananthan* 48645 (MH); Thekkady (850m), 16. 3. 1973, *B.D. Sharma* 43886 (MH).

***Thottea siliquosa* (Lamk.) Ding Hou**

Kanjiar, Idukki (800m), 3. 2. 1983, *C.N. Mohanan* 77956 (MH); Meenmutty-Kulamave, Idukki (660m), *A.G. Pandurangan* 66430 (MH); Meenmutty, Idukki (700m), 27. 9. 1987, *C.N. Mohanan & B. Ramanujan* 72139 (MH); Pambakakki, Pathanamthitta (1100m), 26. 12. 1988, *N. Anilkumar* 1385 (MH); Chittar, Pathanamthitta (300m), 1. 2. 1989, *N. Anilkumar* 1473 (MH).

***Tinospora cordifolia* (Willd.) Miers ex Hook.f. et Thoms.**

Kaikatti to Pothundi, Palghat (725m), 28. 2. 1975, *E. Vajravelu* 46102 (MH); Olavacot, Palghat (75m), 16. 10. 1963, *J. Joseph* 17712 (MH).

***Toona ciliata* Roem.**

Kannoth RF, Cannanore (175m), 18. 2. 1978, V.S. Ramachandran 54067 (MH); Panoth, Cannanore (575m), 21. 4. 1980, K.S. Ramachandran 66937 (MH); South-West Wyanad, 1. 1889, C. Stuart s.n. (MH); Karapara river side, Palghat (850m), 20. 12. 1980, N.C. Nair 69680 (MH); Karapara estate, Palghat, 23. 12. 1980, N.C. Nair 69755 (MH); Parambikulam, Palghat, 29. 7. 1962, K.M. Sebastian 14700 (MH); Kodasseri reserve, Trichur (125m), 14. 9. 1976, K. Ramamurthy 48523 (MH); Vallakadavu, Eucalyptus plantation, 15. 7. 1983, K.N. Subramanian 9480 (IFGTB); Peria-kanal estate, Idukki, 27. 3. 1980, K. Ramamurthy 66529 (MH); Marayur, Munnar (1025m), 26. 4. 1964, K.M. Sebastian 19321 (MH); Peerumedu, Kottayam, 25. 11. 1967, K. Vivekananthan 29354 (MH); Kottur RF, Trivandrum District (150m), 25. 9. 1973, J. Joseph 41962 (MH).

***Tribulus terrestris* L.**

Champakadu, Chinnar, Idukki district, 25.6.1996, K.K.N. Nair & R. Jayakumar 8582 (KFRI).

***Trichosanthes cucumerina* L.**

Kumbala, Cannanore (100m), 14. 10. 1979, R. Ansari 64916 (MH); Trichur, 30. 9. 1884, *Without coll. name* 45 (MH); Meenmutty, Idukki (1000m), 4. 10. 1983, C.N. Mohanan 79179 (MH); Thunakadavu, Parambikulam, Palghat, 28. 10. 1964, C.N. Mohanan 55698 (MH); Varalapadi, Walayar, Palghat, 18. 9. 1975, K.N. Subramanian 5328 (IFGTB).

***Tylophora indica* (Burm.f.) Merr.**

Bhavani river side, Palghat (550m), 9. 3. 1975, E. Vajravelu 46248 (MH); Muthukurassi, Mannarghat, Palghat, 17.9. 1975, K. Swarupananthan 13626 F (MH); Kattappana (975m), 28. 9. 1981, C.N. Mohanan 72078 (MH); Ranni RF, Pathanamthitta (300m), 6. 4. 1980, C.N. Mohanan 68344 (MH); Aickad, Kodumon, Quilon (125m), 19. 7. 1979, C.N. Mohanan 63176 (MH); Kodumon, Quilon (125m), 1. 3. 1979, C.N. Mohanan 61241 (MHH); Thenrnala, Quilon (450m), 18. 5. 1978, C.N. Mohanan 5584 (MH); Way to Kulathupuzha, Trivandrum (250m), 17.5. 1978, M. Mohanan 54850 (MH); Kovalam, Trivandrum (50m), 16. 11. 1979, M. Mohanan 63885 (MH); Varkala, Near S.N. Samadhi, Trivandrum (75m), 12. 11. 1979, M. Mohanan 63830 (MH).

***Uria lagopodioides* (L.) Desv.**

Chindaki, Palghat (575m), 12. 1. 1980, N.C. Nair 65425 (MH); Karivara Forest, Palghat (750m), 28. 11. 1973, E. Vajravelu 44855 (MH); Kanjiar, Idukki, 18.10.1982, K.S. Ramachandran 74665 (MH); Tholnada, Pooyamkutty, Idukki (1000m), 13. 12. 1988, P. Bhargavan 87495 (MH); Periyar river bed, Idukki

(720m), 7. 11. 1981, *B. Ramanujan* 72403 (MH); Othaikkal & Shencotta, Travancore, 7. 11. 1904, *C.A. Barber* 6196 (MH); Chembalakar, Travancore, 4. 11. 1928, *V. Narayanaswamy* 1608 (MH).

***Vateria indica* L.**

Vattapoi, Peria RF, Kannothe, Wynad, 10.7. 1982, *K.N. Subramaninan* 8367 (IFGTB); Kannothe, 23. 2. 1961, *K.N. Subramaninan* 1092 (IFGTB); Mandampatty forests, Palghat, 4. 4. 1983, *N.C. Nair* 77295 (MH); Mandampatty (650m), Palghat, 17. 4. 1978, *N.C. Nair* 56887 (MH); Kannakulangara, Thripunithura, 12. 2. 1967, *K.N. Subramaninan* 2732 (IFGTB); Vallakadavu, Idukki (925m), 4. 10. 1976, *K. Vivekananthan* 48595 (MH); Thenkachi, Idukki District (850m), 23.9. 1972, *B.D. Sharma* 40879 (MH); Ranni Forest Division, 23. 2. 1983, *N.P. Madhavan & K.R. Sasidharan* 9160 (IFGTB); Sea level, Quilon, 22. 12. 1979, *C.N. Mohanan* 65016 (MH); Moozhiar RF, Quilon, 20. 3. 1978, *M. Mohanan* 54305 (MH); Quilon, sea level, 20. 12. 1979, *M. Moharzan* 650007 (MH); Quilon, March 1906, *T.F. Bourdillon* 893 (IFGTB); Kulathupuzha river valley, Thenmala, 23. 4. 1976, *K.N. Subramanian* 5947 (IFGTB); Kallar bridge, Ponmudi, 10. 6. 1876, *Without coll. name and number* (MH); Near Tagore Centenary hall, Trivandrum (125m), 28. 2. 1979, *M. Mohanan* 59409 (MH); Thorai stream, Travancore, 4. 11. 1928, *V. Narayanaswamy* 1210 (MH); Kaviar, Trivandrum (225m), 17. 3. 1978, *M. Mohanan* 54699 (MH); Anchunazhikathode, Kottur, Trivandrum (200m), 5. 3. 1980, *M. Mohanan* 66075 (MH).

***Ventilago madraspatana* Gaertn.**

Chembukauv, Cannanore, 20. 1. 1979, *V.J. Nair* 59726 (MH); Wynad, 1881, *R.H. Beddome s.n.* (Acc. No. 10380, MH).

***Vetiveria zizanioides* (L.) Nash.**

On the way to Kottiyur, Cannanore, (550m), 12. 11. 1978, *V.S. Ramachandran* 58694 (MH); Trichur, 7. 9. 1976, *K. Ramamurthy* 48402 (MH).

***Zanthoxylum rhetsa* (Roxb.) DC.**

Kalliasseri, Kasaragod (125m), 22. 6. 1980, *R. Ansari* 64982 (MH); Thaliparamba farm, Cannanore, 13. 2. 1913, *C.A. Barber* 8683 (MH); Kutiyadi submergible area (190m), 27. 6. 1965, *B.D. Nuithani* 24663 (MH); Nedumboil, Malabar, 16. 12. 1913, *Without coll. name* 9628 (MH); Travancore, 6. 11. 1928, *V. Narayanaswami* 1310 (MH); Travancore (1000 ft.), 5. 11. 1894, *T.F. Bourdillon* 389 (MH).

***Zingiber zerumbet* (L.) Rose. ex Smith**

Cheruvathur, Cannanore (50m), 30.6. 1980, *R. Ansari* 67927 (MH); Kannothe, Cannanore (140m), 13.8. 1980, *V.S. Ramackandran* 66967 (MH); Mancheri, Malappuram (140m), 4. 8. 1970, *J.L. Ellis* 35375 (MH); Parambikulam, Palghat (1240m), 29.7. 1962, *K.M. Sebastine* 14700 (MH); Kodasseri reserve, Trichur (125m), 25.9. 1973, *K. Ramamurthy* 58523 (MH); Pooyamkutty, Idukki (50m), 6.7. 1988, *P. Bhargavan* 87399 (MH); Valara, Idukki Dist. (525m), 21.8. 1965, *K.M. Sebastine* 25352 (MH); Thannithodu, Pathanamthitta (725m), 5. 6. 1988, *N. Anilkumar* 612 (MH); Nilakkal, Quilon (850m), 2.9. 1977, *N.C. Nair* 50829 (MH); Sangilipalam, Kulathupuzha, Thenmala, 6. 8. 1985, *N. Venketasubramanian* and *K.R. Sasidharan* 11159 (IFGTB); Kottur RF, Trivandrum (150m), 25.9. 1973, *J. Joseph* 41962 (MH).

### 13. INDEX TO LOCAL NAMES

- Ada-kodian 205  
 Adalodakam 43  
 Adapathiyan 205  
 Adathoda 43  
 Adavi-kachola 151  
 Akil 126  
 Alpam 356  
 Ama 250  
 Amalakam 265  
 Amalpori 290  
 Amari 213  
 Amukluram 58  
 Anachukiri 288  
 Ana-koova 141  
 Ana-naru 334  
 Anathippali 288  
 Ankolam 51  
 Anthochini 36  
 Apakudukka 136  
 Apparutakka 136  
 Ara-anjili 60  
 Aralu 259  
 Arambu 279  
 Arantal 259  
 Aratha 53  
 Ari-chooral 105  
 Arinjil 51  
 Asokam 305  
 Athithippali 288  
 Attu 36  
 Attu-iluppa 228  
 Attu-maruthu 348  
 Avaram 119  
 Azhinil 51  
 Canna-kuva 141  
 Chakari-nuran 168  
 Chakkara-kolli 195  
 Chandanam 298  
 Chandanamaram 298  
 Changalam-paranda 134  
 Channa-koova 141  
 Chappangam 87  
 Chaval 168  
 Cheevakayi 33  
 Chemmaram 62  
 Chennakkava 141  
 Cherin-kuru 315  
 Cheru 315  
 Cheru-chooral 101, 105  
 Cheru-chunda 328  
 Cheru-mula 311  
 Cheru-paruva 320  
 Cheru-thecku 109  
 Chewari 215  
 Chigiri 188  
 Chikaka 33  
 Chinikka 33  
 Chittamruthu 358  
 Chittaratha 272  
 Chittelam 200  
 Chitrappala 184  
 Chittu 311  
 Chooral 89, 91, 99, 101, 107  
 Choppala 261  
 Chora-venga 284  
 Chorla 245  
 Chuvanna-akil 126  
 Chuvanna-amalpori 290  
 Cillu 181  
 Damika 68  
 Danti-moola 68  
 Daramba 188  
 Dhup 48  
 Dronika 213  
 Edampiri-valampiri 196  
 Eelam 176  
 Eeetta 254  
 Eelakka 176  
 Elavarangam 131  
 Elengi 234



- Era-kalli 257  
 Eshwara-mulla 64  
 Garudakodi 64  
 Grymina 213  
 Guggulu 77  
 Ilattimaravala 288  
 Ilavu 74  
 Illi 70  
 Incha 36  
 Inchi-pullu 158  
 Inna 36  
 Irikki 181  
 Irumbakam 206  
 Irupu 206  
 Jeevakam 229  
 Kacholam 218  
 Kachula-kizhangu 218  
 Kachuri-kizhangu 153  
 Kadalavanakku 56,68, 145  
 Kadukka 353  
 Kakka-chooral 95  
 Kakka-valli 181  
 Kallan 95  
 Kallan-mula 162  
 Kal-mugil 162  
 Kal-payin 172  
 Kal-thamara 241  
 Kalur-vanchi 293  
 Kambakam 206  
 Kambli-vetti 344  
 Kambu 279  
 Kanchavu 117  
 Kanchavu-chedi 117  
 Kanikonna 122  
 Kanjiram 339  
 Karagil 62  
 Kara-kanjiram 58  
 Karalakam 64  
 Karal-vekam 64  
 Kareenja 31  
 Kareenja-patta 31  
 Kar-eetta 254  
 Karenda-valli 64  
 Karim-kuringi 243  
 Karing-kura 336  
 Karinjotta 296  
 Karinthakara 296  
 Karinthakara 284  
 Karivela-maram 28  
 Karivelom 28  
 Karukkam-puli 188  
 Karutha-kunthirikam 114  
 Kasturi-manjal 153  
 Katakam 342  
 Kattavanakku 223  
 Kattinchi 381  
 Kattu-chooral 97, 105  
 Kattu-illupa 228, 261  
 Kattu-inchi-koova 381  
 Kattu-jathika 239  
 Kattu-karuva 128  
 Kattu-karuva-patta 128  
 Kattu-kolinji 381  
 Kattu-kurumulagu 170  
 Kattu-kuva 153  
 Kattu-manjal 149, 151  
 Kattu-mannar 149  
 Kattu-murikku 379  
 Kattu-nannari 161  
 Kattu-padavalam 365  
 Katturan 323  
 Kattu-valli 133  
 Kavalam 331  
 Kazhanchi 85  
 Kazhanchi-kay 85  
 Kazhanji-kuru 85  
 Killi 142  
 Kiriath 58  
 Kiriyaattu 58  
 Kodakappala 202  
 Kodam-puli 185  
 Kodapala 220  
 Koda-puli 185  
 Kodi-pullu 158  
 Kolangi 250  
 Kolinchi 53

- Konna 122  
 Konna-maram 122  
 Koova 151  
 Koovalam 45  
 Korna-pidan 168  
 Kottashari 356  
 Kotti 209  
 Kula-maruthu 348  
 Kulamavu 263  
 Kulavu 220  
 Kumala 192  
 Kumbi 51  
 Kumbil 192  
 Kumilu 192  
 Kungilium 77  
 Kunni 26  
 Kunni-kuru 26  
 Kunthirikam 77, 114  
 Kunthirika-payin 114  
 Kundirikka-maram 77  
 Kurumthotti 325  
 Madhuparnika 213  
 Magadhi 268  
 Mahali-kizhangu 161  
 Malampuvam 62  
 Malanthakara 284  
 Malathangi 133  
 Mala-veppu 126  
 Manchadi 40  
 Manchatti 294  
 Manga-inchi 148  
 Mangishta 294  
 Manja-koova 151  
 Mara-mangal 138  
 Mara-vetti 209  
 Maravuri 60  
 Marotti 209  
 Mathagiri-vembu 360  
 Mattipal 48  
 Mayirmanikkam 327  
 Mazhu-kanjiram 339  
 Meen-puli 185  
 Mentthoni 190  
 Mettonni 190  
 Minari 274  
 Mocha 74  
 Moongil 70  
 Moovila 277  
 Mula 70  
 Mulliapoola 74  
 Mullilam 379  
 Mullilavu 74  
 Naga -danti 68, 346  
 Naicorna 237  
 Naicornam 237  
 Nai-kumbil 109  
 Nalla-mulagu 270  
 Nanga 346  
 Nangin-kuru 56  
 Nangu 231  
 Nannari 198  
 Nanyura 311  
 Naru-neenti 198  
 Natturava 151  
 Nedu-naru 223  
 Neela-amari 213  
 Neervalam 142, 145, 209  
 Neer-vetti 209  
 Nelli 265  
 Nellika-maram 265  
 Nervealom 68  
 Nerinjil 363  
 Nerinnal 363  
 Nettavil 60  
 Nilam 213  
 Nilappala 184  
 Nilappana 146  
 Nilaveppu 58  
 Nilappana-kizhangu 146  
 Nili 213  
 Niratti-muthu 68  
 Nir-maruthu 348  
 Nir-matholam 142  
 Nirvala 142  
 Njara 346  
 Njaval 346

Njota 296 168  
 Nuran 168  
 Nuran-kizhangu 168  
 Odal 309  
 Ooravu 263  
 Orila 166,369  
 Orila-thamara 241  
 Ottal 250  
 Ottamoodan 93  
 Paal-vally 2 11  
 Pacha-chural93  
 Pachendi 261  
 Pachotti 344  
 Padathali 156  
 Padavalam 365  
 Pala 261  
 Palaka-paiyani 259  
 Palasin-samatha 81  
 Pali 261  
 Palmuthakku 217  
 Panampalka 239  
 Panichi 70  
 Panichi-kaya 70  
 Panni-chooral 103  
 Panyara 136  
 Paranki-sambrani 77  
 Parei-panji 136  
 Pasakotta 302  
 Pathiri 336  
 Pathiri-poov 239  
 Pattu-valli 133  
 Payin 371  
 Pella 56  
 Papatolam 365  
 Peppadal 365  
 Peraratha 53  
 Peri 23 1  
 Perumaram 48  
 Perum-payin 371  
 Perun-naval346  
 Pinam-puli 185  
 Pinari 245  
 Pinnar-puli 188

Pippali 268  
 Pongalliyam 48  
 Ponnam-poov 239  
 Poopathiri 336  
 Pula-kizhanna 153  
 Pungu 274  
 Punna 111  
 Punnangan 185  
 Punnu 274  
 Pu-palasu 81  
 Pupathiri 336  
 Puram-puli 185  
 Puthiri-chunda 328  
 Puvam 313  
 Rajani 213  
 Ramacham 376  
 Sambiri 315  
 Sappannam 87  
 Sarpa-gandhi 290  
 Sharkara-kolli 195  
 Shathavari 66  
 Shivali-kodi 294  
 Shurali 220  
 Sitha-amruthu 358  
 Sithari 171  
 Soma 307  
 Soma-latha 307, 309  
 Soma-valli 309  
 Sural 374  
 Suvapaval-poriyan 290  
 Terra 342  
 Terram-para1342  
 Thadiyan-chooral 103  
 Thaluram 318  
 Thambakam 206  
 Thanni 351  
 Thannikka 351  
 Thelli 114  
 Thembra-kay 315  
 Thenkotta 315  
 Therucalli 184  
 Theruvai 158  
 Thettam-para1 342

- Thin-perivelam 109  
Thippali 268  
Thiruvittikkanni 179  
Thondi 331  
Thouttan 51  
Thumpa-koduveli 272  
Tusham 351  
Ungu 274  
Urulingi 302  
Vakka 334  
Valiya-chooral 103  
Valli-kurunthotti 322  
Valli-pala 367  
Vandi-chooral 103  
Vanthal 95  
Vattu-pullu 158  
Vavangu 172  
Vayambu 38  
Vayvillankam 179  
Vei 254  
Veli-chooral 95  
Vella-agil 174  
Vella-ayani 172  
Vellachadachi 223  
Vellachanna 149  
Vella-eeta 248  
Vella-koduveli 272  
Vella-kunthirikkam 77, 371  
Vella-kurunthotti 323  
Vella-maruthu 348  
Vella-odal 309  
Vella-payin 371  
Velluppan 323  
Velluran 323  
Velukku 223  
Velutha-champakam 231  
Velutha-pala 231  
Vembadam 374  
Vembadam-patta 374  
Vembu 360  
Venga 284  
Venta 223  
Ventorii 190  
Viraka 114  
Vishalam 179  
Vizhal 179  
Vlathi 225  
Watte 281

**14. INDEX TO BOTANICAL NAMES**( *Up-to-date names in bold letters* )

- Abrus precatorius* L. 26  
 Acacia arabica *auct.* 28  
 Acacia caesia Wt. *et* Arn. 36  
 Acacia concinna (Willd.) DC.33  
 Acacia concinna (Willd.) DC. var. rugata (Lamk.) Baker 33  
 Acacia intsia Willd. var. caesia (Wt. *et* Arn.) Baker 36  
**Acacia nilotica** (L.) Willd. *ex* Delile 28  
**Acacia pennata** (L.) Willd. 31  
 Acacia rugata (Lamk.) Merr. 33  
**Acacia sinuata** (Lour.) Merr. 33  
**Acacia torta** (Roxb.) Craib 36  
**Acorus calamus** L. 38  
 Acorus calamus L. var. verus L.38  
 Acorus verus (L.) Burm. f. 38  
**Adenantha pavonina** L. 40  
 Adenantha triphysa Dennst. 47  
 Adhatoda vasica Nees 43  
**Adhatoda zeylanica** Medic. 42  
**Aegle marmelos** (L.) Corr. 45  
 Aglaia polystachya Wall. 62  
 Ailanthus kurzii Prain 48  
 Ailanthus malabarica DC. 47  
**Ailanthus triphysa** (Dennst.) Alston 47  
 Alangium decapetalum Lamk. 51  
 Alangium lamarckii Thw. 51  
**Alangium salvifolium** (L.f.) Wang. 51  
 Alpinia cardamomum (L.) Roxb. 176  
**Alpinia galanga** (L.) Sw. 53  
 Alpinia rheedii Wt. 53  
 Alpinia sessilis Koen. 218  
 Amomum cardamomum L. 176  
 Amomum sylvestre Lamk. 381  
 Amomum zedoaria Christm. 153  
 Amomum zerumbet L. 381  
 Amooro rohituka (Roxb.) Wt. *et* Am. 62  
**Anamirta cocculus** (L.) Wt. *et* Am. 55  
 Anamirta paniculata Colebr. 56  
**Andrographis paniculata** (Burm.f.) Wall. *ex* Ness 58  
 Andrographis subspathulata Clarke 58  
 Andropogon flexuosus Nees *ex* Steud. 158

- Andropogon muricatus Retz. 376  
 Andropogon nardus L. ssp. flexuosus (Nees ex Steud.) Hack. 158  
 Andropogon squarrosus *auct.* 376  
 Antiaris innoxia Bl. 60  
 Antiaris saccidora Dalz. 60  
**Antiaris toxicaria** Leschen. 60  
 Apama dubia J.F. Gmel. 356  
 Apama siliquosa Lamk. 356  
**Aphanamixis polystachya** (Wall.) Parker 62  
 Apocynum frutescens L. 211  
**Aristolochia indica** L. 64  
 Aristolochia lanceolata Wt. 64  
 Arundinaria densifolia Munro 125  
 Arundinaria wightiana Nees 215  
 Arundo bambos L. 70  
 Asclepias acida Roxb. 307  
 Asclepias annularis Roxb. 204  
 Asclepias asthmatica L.f. 367  
 Asclepias prolifera Ainslie 367  
**Asparagus racemosus** Willd. 66
- Baliospermum axillare Bl. 68  
 Baliospermum montanum (Willd.) Muell.- Arg. 68  
 Baliospermum polyandrum Wt. 68  
**Baliospermum solanifolium** (J.Burm.) Suresh 68  
 Bambos arundinacea Retz. 70  
 Bambusa arundinacea (Retz.) Willd. 70  
**Bambusa bambos** (L.) Voss 70  
 Bambusa ritcheyi Munro 282  
 Bambusa scriptoria Dennst. 250  
 Bambusa spinosa Roxb. 70  
 Bambusa stricta Roxb. 162  
 Bambusa wightii Munro 257  
 Banksia speciosa Koen. 140  
 Bassia elliptica Dalz. 261  
 Bassia malabarica Bedd. 228  
 Bassia neriifolia Moon. 227  
 Begonia indica L. 259  
 Bheesa rheedii Kunth 250  
 Bheesa travancorica Bedd. 254  
 Bignonia chelonoides *sensu* Roxb. 336  
 Bignonia colais Buch.-Ham. ex Dillw. 336  
**Bombax ceiba** L. 74

- Bombax gossypium Cav. 136  
 Bombax malabaricum DC. 74  
 Bombax religiosum L. 136  
 Boswellia glabra Roxb. 77  
**Boswellia serrata** Roxb. ex Colebr. 77  
 Boswellia serrata Roxb. ex Colebr. glabra (Roxb.) Benn. 77  
 Bragantia wallichii R. Br. ex Wt. et Arn. 356  
 Butea frondosa Koen. ex Roxb. 81  
**Butea monosperma** (Lamk.) Taub. 81
- Caesalpinia bonduc** (L.) Roxb. 85  
 Caesalpinia bonducella (L.) Flem. 85  
 Caesalpinia crista L. 85  
**Caesalpinia sappan** L. 87  
**Calamus brandisii** Becc. ex Becc. et Hook.f. 89  
**Calamus dransfieldii** Renuka 91  
**Calamus gamblei** Becc. ex Becc. et Hook.f. 93  
**Calamus hookerianus** Becc. 95  
**Calamus latifolius** Roxb. 97  
 Calamus longisetus *sensu* Thw. 103  
**Calamus pseudotenuis** Becc. ex Becc. et Hook.f. 99  
 Calamus rheedei Griff. 97  
**Calamus rotang** L. 101  
 Calamus tenuis *sensu* Thw. 99  
**Calamus thwaitesii** Becc. et Hook.f. 103  
 Calamus thwaitesii Becc. var. canaranus Becc. 103  
**Calamus travancoricus** Bedd. ex Becc. 105  
**Calamus vattayila** Renuka 107  
 Callicarpa lanata L. 109  
 Callicarpa lobata Clarke 109  
 Callicarpa rheedii Kostel. 109  
**Callicarpa tomentosa** (L.) L. 109  
 Callicarpa wallichiana Walp. 109  
**Calophyllum inophyllum** L. 111  
 Calophyllum nagassarium Burm.f. 231  
 Calosanthus indica Bl. 259  
 Canarium resiniferum Brace ex King 114  
**Canarium strictum** Roxb. 114  
 Cannabis indica Lamk. 116  
**Cannabis sativa** L. ssp. indica (Lamk.) Small. et Cronq. 116  
 Cannabis sativa L. ssp. indica var. *indica* (Lamk.) Wehm. 116  
 Cannabis sativa L. var. *indica* (Lamk.) Boorsma 116  
 Cannabis sativa *sensu* Roxb. 116

- Capparis magna Lour. 142  
 Carpopogon pruriens (L.) Roxb. 237  
**Cassia auriculata** L. 119  
**Cassia fistula** L. 122  
 Cassia rhombifolia Roxb. 122  
 Cedrela toona Roxb. ex Rottl. *et* Willd. 360  
 Cedrela toona Roxb. ex Rottl. var. *listeri* C. DC. 360  
 Chavica roxburghii Miq. 268  
 Chavica sarmentosa Miq. 268  
 Chilmoria pentandra Ham. 209  
**Chimonobambusa densifolia** (Munro) Nakai 125  
 Chonemorpha antidysenterica (Roth.) G. Don 202  
**Chukrasia tabularis** Juss. 126  
 Cinnamomum iners *auct. non* Reinw. ex Bl. 128  
 Cinnamomum macrocarpum *auct.* 131  
 Cinnamomum malabathrum (Lamk.) Persl 128  
**Cinnamomum malabathrum** (Burm.f.) Bl. 128  
**Cinnamomum sulphuratum** Nees 131  
 Cinnamomum zeylanicum *auct.* 128  
 Cissampelos convolvulacea Willd. 132  
 Cissampelos hirsuta Buch.-Ham. ex DC. 132  
**Cissampelos pareira** L. var. *hirsuta* (Buch.-Ham. ex DC.) Forman 132  
 Cissampelos pareira L. 132  
 Cissus edulis Dalz. 134  
**Cissus quadrangularis** L. 134  
 Cocculus convolvulaceus DC. 358  
 Cocculus cordifolius (Willd.) DC. 358  
 Cocculus peltatus (Poir.) DC. 156  
 Cochlospermum gossypium DC. 136  
**Cochlospermum religiosum** (L.) Alston 136  
 Combogia gummi-gutta 188  
 Convolvulus paniculatus L. 216  
**Cosciniumpfestratum** (Gaertn.) Coleb. 138  
 Coscinium wallichianum Miers 138  
 Coscinium wightianum Miers 138  
**Costus speciosus** (Koen.) Sm. 140  
 Costus speciosus (Koen.) Sm. var. *nepalensis* (Rosc.) Baker 140  
 Crataeva magna (Lour.) DC. 142  
 Crataeva marmelos L. 45  
**Crataeva nurvala** Ham. 142  
 Crataeva religiosa Forst.f. var. *nurvala* (Ham.) Hook.f. *et* Thorns. 142  
 Crataeva religiosa *sensu* Dunn 142  
 Croton solanifoliosus J. Burn 68



- Croton tiglium* L. 144  
 Curculigo malabarica Wt. 146  
*Curculigo orchioides* Gaertn. 146  
*Curcuma amada* Roxb. 147  
 Curcuma angustifolia *auct.* 151  
*Curcuma aromatica* Salisb. 149  
*Curcuma neilgherrensis* Wt. 151  
*Curcuma zedoaria* (Christm.) Rosc. 153  
 Curcuma zedoaria *sensu* Roxb. 149  
 Curcuma zerumbet Roxb. 153  
 Cyclea arnottii Miers 156  
 Cyclea burmanii Wt. *et* Arn. 156  
*Cyclea peltata* (Poir.) Hook.f. *et* Thoms. 156  
*Cymbopogon flexuosus* (Nees *ex* Steud.) Wats. 158  
 Cynanchum indicum Burm.f. 367  
 Cytissus pinnatus L. 274
- Daemonorops rheedii Mart. 97  
*Decalepis hamiltonii* Wt. *et* Arn. 161  
 Dendrocalamus monadelphus Thw. 280  
*Dendrocalamus strictus* (Roxb.) Nees 162  
 Desmodium collinum Roxb. 165  
*Desmodium gangeticum* (L.) DC. 165  
 Dichopsis elliptica Benth. 261  
*Dioscorea pentaphylla* L. 167  
 Dioscorea pentaphylla L. var. communis Prain *et* Burk. 168  
 Dioscorea pentaphylla L. var. rheedii Prain *et* Burk. 168  
 Dioscorea triphylla L. 168  
 Diospyros embryopteris *acut.* 169  
 Diospyros glutinosa Koen. *ex* Roxb. 169  
*Diospyros malabarica* (Desr.) Kostel. 169  
 Diospyros peregrina *acut.* 169  
*Dipterocarpus indicus* Bedd. 172  
 Dipterocarpus turbinatus *auct.* 172  
 Dipterosperma personatum Hassk. 336  
 Dolichos pruriens L. 237  
 Doodia lagopodioides (L.) Roxb. 369  
*Dysoxylum malabaricum* Bedd. *ex* Hiern 174
- Echites antidysenterica Roth 202  
 Echites frutescens (L.) Roxb. 21 1  
 Echites malabarica Lamk. 211  
 Echites pubescens Buch.-Ham. 202

- Ehretia cuneata Wt. 292  
 Elettaria cardamomum (L.) Maton var. minus Watt 176  
**Elettaria cardamomum** (L.) Maton 176  
 Embelia glandulifera Wt. 179  
**Embelia ribes** Burm.f. 179  
 Emblica officinalis Gaertn. 265  
 Entada phaseoloides *auct.* 181  
 Entada pursaetha DC. 181  
**Entada rheedii** Spreng. 181  
 Entada scandens *auct.* 181  
 Entada schefferi Ridl. 181  
 Erythrina monosperma Lamk. 81  
 Eugenia jambolana Lamk. 346  
**Euphorbia thymifolia** L. 184
- Fagara budrunga Roxb. 379  
 Fagara rhetsa Roxb. 379  
 Feronia elephantum Corr. 225  
 Feronia limonia (L.) Swingle 225
- Garcinia cambogia** (Gaertn.) Desr. 185  
 Garcinia cambogia (Gaertn.) Desr. var. conicarpa (Wt.) Anders. 185  
 Garcinia cambogioides Royle 188  
 Garcinia gutta Wt. 188  
**Garcinia gummi-gutta** (L.) Robs. 188  
 Garcinia gummi-gutta *sensu* Robs. 185  
 Garcinia malabarica Desr. 169  
 Garcinia morella (Gaertn.) Desr. 188  
 Garcinia roxburghii Wt. 185  
**Gloriosa superba** L. 190  
 Glycine abrus L. 26  
**Gmelina arborea** Roxb. 192  
 Gmelina rheedii Hook. 192  
 Gossampinus malabaricus (DC.) Merr. 74  
 Grewia salvifolia L.f. 51  
 Guilandina bonduc L. 85  
 Guilandina bonducella L. 85  
**Gymnema sylvestre** (Retz.) R.Br. *ex* Schult. 194
- Hardwickia pinnata Roxb. *ex* DC. 220  
 Hebradendron cambogioides Grah. 188  
 Hedysarum gangeticum L. 165  
 Hedysarum lagopodioides L. 369

- Hedysarum viscidum* L. 277  
*Helicteres isora* L. 196  
*Hemidesmus indicus* (L.) R. Br. 198  
*Heracleum ringens* Wall. ex DC. 200  
*Holarrhena antidysenterica* (Roth) A. DC. 202  
*Holarrhena pubescens* (Buch.-Ham.) Wall. ex G. Don 202  
*Holostemma ada-kodien* R. Br. ex Schult. 204  
*Holostemma annulare* (Roxb.) Schum. 204  
*Holostemma rheedianum* Spreng. 204  
*Holostemma rheedii* Wall. 205  
*Hopea parviflora* Bedd. 206  
*Hydnocarpus inebrians sensu* Wt. et Arn. 209  
*Hydnocarpus laurifolia* (Dennst.) Sleum. 209  
*Hydnocarpus pentandrus* (Ham.) Oken 208  
*Hydnocarpus wightiana* Bl. 209  
  
*Ichnocarpus frutescens* (L.) R. Br. 211  
*Illipe malabarica* (Bedd.) Engl. 228  
*Indegofera sumatrana* Gaertn. 213  
*Indigofera tinctoria* L. 213  
*Indocalamus wightianus* (Nees) Nakai 215  
*Ipomoea digitata auct.* 217  
*Ipomoea mauritiana* (L.) Jacq. 216  
*Ipomoea paniculata* (L.) R. Br. 217  
*Isonandra acuminata* Drury 261  
  
*Jatropha montana* Willd. 68  
*Jonesia asoca* Roxb. 305  
*Justicia adhatoda* L. 43  
*Justicia paniculata* Burm.f. 58  
  
*Kaempferia galanga* L. 218  
*Kingiodendron pinnatum* (Roxb. ex DC.) Harms 220  
*Kydia calycina* Roxb. 222  
*Kydia fraterna* Roxb. 223  
*Kydia roxburghiana* Wt. 223  
  
*Languas galanga* (L.) Stuntz 53  
*Laurus cassia* Heyne ex Nees 131  
*Laurus culitlawan* Wt. ex Meissner 128  
*Laurus malabathrica* Soland. ex Roxb. 128  
*Laurus malabathrum* Burm.f. 128  
*Limonia acidissima* L. 225  
*Limonia eliphentum* (Corr.) Panigrahi 225

- Machilus macrantha* Nees 263  
*Madhuca malabarica* (Bedd.) Parker 228  
***Madhuca nerifolia*** (Moon.) H.J. Lam. 227  
***Malaxis rheedii*** Sw. 229  
*Malaxis versicolor* Lindl. 229  
*Mangostana cambogia* Gaertn. 185  
*Mangostana morella* Gaertn. 188  
*Mappia foetida* (Wt.) Miers 244  
*Mappia ovata* Miers 244  
*Maranta galanga* L. 53  
*Melochia cordata* Burm.f. 322  
*Menispermum cocculus* L. 56  
*Menispermum cordifolium* Willd. 358  
*Menispermum fenestratum* Gaertn. 138  
*Menispermum peltatum* Poir. 156  
***Mesua ferrea*** L. 231  
*Mesua nagana* Gardn. 231  
*Mesua nagassarium* (Burm.f.) Kosterm. 231  
*Mesua roxburghii* Wt. 231  
*Mesua thwaitesii* Planch. *et* Triana 231  
*Microstylis rheedii sensu auct.* 229  
*Microstylis versicolor* Lindl. 229  
*Mimosa concinna* Willd. 33  
*Mimosa entada* L. 181  
*Mimosa nilotica* L. 28  
*Mimosa pennata* L. 31  
*Mimosa sinuata* Lour. 33  
*Mimosa torta* Roxb. 36  
***Mimusops elengi*** L. 234  
*Mimusops parviflora* R. Br. 234  
*Monstera pertusa* (Roxb.) Schott 288  
***Mucuna pruriens*** (L.) DC. 237  
*Mucuna prurita* Hook. 237  
*Mucuna utilis* Wall. *ex* Wt. 209  
*Munnicksia laurifolia* Dennst. 209  
***Myristica malabarica*** Lamk. 239  
*Myrobalanus bellirica* Gaertn. 351  
*Myrtus cumini* L. 346  
*Myrtus laurina* Retz. 344  
  
***Nervilia aragoana*** Gaud. 240  
*Nervilia carinata* Wt. 240  
*Nervilia scottii* (Reichb.f.) Schltr. 241

*Nilgirianthus ciliatus* (Nees) Bremek. 242  
*Nothapodytes foetida* (Wt.) Sleum. 244  
*Nothapodytes nimmoniana* (Garh.) Mabber. 244

*Ochlandra beddomei* Gamble 246  
*Ochlandra brandisii* Gamble 257  
*Ochlandra ebracteata* Raiz. et Chatt. 248  
*Ochlandra rheedii* (Kunth) Benth. et Hook.f. ex Gamble 250  
*Ochlandra rheedii* (Kunth) Benth. var. *sivagiriana* Gamble 251  
*Ochlandra scriptoria* (Dennst.) Fisch. 250  
*Ochlandra sivagiriana* (Gamble) Camus 251  
*Ochlandra travancorica* (Bedd.) Benth. 254  
*Ochlandra wightii* (Munro) Fisch. 257  
*Ophioxylum sarmentinum* L. 290  
*Ophioxylon trifoliatum* Gaertn. 290  
*Oroxylum indicum* (L.) Vent. 259  
*Oxytenanthera bourdillonii* Gamble 279  
*Oxytenanthera monadelphica* (Thw.) Alston 281  
*Oxytenanthera monostigma* Bedd. 282  
*Oxytenanthera ritcheyi* (Munro) Blatt. et Mc Cann 282  
*Oxytenanthera thwaitesii* Munro 281

*Palaquium ellipticum* (Dalz.) Baill. 261  
*Pastinaca ringens* (Wall. ex DC.) Wt. 200  
*Pentaptera arjuna* Roxb. ex DC. 348  
*Periploca indica* L. 198  
*Periploca sylvestre* Retz. 195  
*Persea macrantha* (Nees) Kosterm. 263  
*Phalaris zizanioides* L. 376  
*Phyllanthus emblica* L. 265  
*Piper latifolium* Hunter 268  
*Piper longum* L. 268  
*Piper nigrum* L. 270  
*Piper sarmentosum* Wall. 268  
*Piper tubinatum* Noronha 268  
*Pistacia oleosa* Lour. 313  
*Plumbago zeylanica* L. 272  
*Pogonia flabelliformis* Wall. ex Lindl. 240  
*Pogonia scottii* Reichb.f. 241  
*Pongamia glabra* Vent. 274  
*Pongamia pinnata* (L.) Pierr. 274  
*Pothos pertusus* Roxb. 288  
*Premna nimmoniana* Grah. 244

- Pseudarthria viscida* (L.) Wt. et Arn. 277  
*Pseudoxytenanthera bourdillonii* (Gamble) Naith. 279  
*Pseudoxytenanthera monadelpha* (Thw.) Sodes. et Ellis 280  
*Pseudoxytenanthera ritcheyi* (Munro) Naith. 282  
*Pterocarpus bilobus* Roxb. ex G. Don 284  
*Pterocarpus marsupium* Roxb. 284
- Quassia indica (Gaertn.) Nooteb. 296
- Raphidophora pertusa* (Roxb.) Schott 288  
*Rauwolfia serpentina* (L.) Benth. et Kurz 290  
*Rhabdia lycioides sensu* Clarke 292  
*Rotula aquatica* Lour. 292  
*Rubia cordifolia* L. 294  
*Rubia manjista* Roxb. 294  
*Rubia scandens* Zoll. et Merr. 294
- Salamalia malabarica (DC.) Schott 74  
*Samadera indica* Gaertn. 296  
*Santalum album* L. 296  
*Sapindus emarginatus* Vahl 302  
*Sapindus laurifolia* Vahl 302  
*Sapindus trifoliata* L. 301  
*Saraca asoca* (Roxb.) Wilde 304  
*Saraca indica auct.* 305  
*Sarcostemma acidum* (Roxb.) Voigt 307  
*Sarcostemma annulare* Roth 205  
*Sarcostemma brevistigma* Wt. et Arn. 307  
*Sarcostigma edule* Kurz 309  
*Sarcostigma kleinii* Wt. et Arn. 309  
*Sarcostigma wallichii* Baill. 309  
*Schinus limonia* L. 225  
*Schizostachyum beddomei* (Fisch.) Majum. 311  
*Schleichera oleosa* (Lour.) Oken 313  
*Schleichera trijuga* Willd. 313  
*Scindapsus pertusus* (Roxb.) Schott 288  
*Semecarpus anacardium* L.f. 315  
*Senna auriculata* Roxb. 119  
*Shorea laccifera* (Wt. et Arn.) Heyne ex Wall. 318  
*Shorea roxburghii* G. Don 318  
*Shorea talura* Roxb. ex DC. 318  
*Sida acuta* L. 320  
*Sida beddomei* Jacob 322

- Sida carpinifolia* *auct.* 320  
*Sida cordata* (Burm.f.) Bross. 321  
*Sida cordifolia* L. 323  
*Sida humilis* Cav. 322  
*Sida lanceolata* Retz. 320  
*Sida rhombifolia* L. 325  
*Sida rhombifolia* ssp. *rhombifolia* Bross. 325  
*Sida rhombifolia* ssp. *rhombifolia* var. *rhombifolia* Paul *et* Nayar 325  
*Sida spinosa* L. 327  
*Sida veronicifolia* Lamk. 322  
*Solanum anguivi* *sensu* Mathew *et* Rani 328  
*Solanum indicum* *sensu auct.* 328  
*Solanum violaceum* Ortega 328  
*Spathodea indica* Pers. 259  
*Sterculia urens* Roxb. 331  
*Sterculia villosa* Roxb *ex* DC. 334  
*Stereospermum chelonoides* *sensu* DC. 336  
*Stereospermum colais* (Buch.-Ham. *ex* Dillw.) Mabber. 336  
*Stereospermum personatum* (Hassk.) Chatt. 336  
*Stereospermum tetragonum* DC. 336  
*Stizolobium pruriens* (L.) Medic. 237  
*Strobilanthes ciliatus* Nees 243  
*Strychnos nux-vomica* L. 339  
*Strychnos potatorum* L.f. 342  
*Symplocos cochinchinensis* (Lour.) Moore ssp. *laurina* (Retz.) Nooteb. 344  
*Symplocos spicata* Roxb. 344  
*Symplocos spicata* Roxb. var. *laurina* (Retz.) Clarke 344  
*Syzygium cumini* (L.) Skeels 346  
*Syzygiumjambolanum* (Lamk.) DC. 346
- Teinostachyum beddomei* Fisch. 311  
*Teinostachyum wightii* Bedd. 311  
*Terminalia arjuna* (Roxb *ex* DC.) Wt. *et* Arn. 348  
*Terminalia bellirica* (Gaertn.) Roxb. 351  
*Terminalia berryi* Wt. *et* Arn. 348  
*Terminalia chebula* Retz. 353  
*Terminalia taria* Ham. 351  
*Thottea siliquosa* (Lamk.) Ding Hou 356  
*Tinospora cordifolia* (Willd.) Miers *ex* Hook.f. *et* Thoms. 358  
*Tomex tomentosa* L. 109  
*Toona ciliata* Roem. 360  
*Tribulus languinosus* L. 363  
*Tribulus terrestris* L. 362

- Trichosanthes anjuina L. 365  
**Trichosanthes cucumeriana** L. 364  
 Tylophora asthmatica (L.f.) Wt. *et* Arn. 367  
**Tylophora indica** (Burm.f.) Merr. 367
- Uraria alopecuroides Sweet 369  
**Uraria lagopodioides** (L.) Desv. 369  
 Uraria repanda Wall. *ex* Benth. 369  
 Usteria racemosa Dennst. 344
- Vateria indica** L. 371  
 Vateria malabarica Bl. 371  
 Vatica laccifera Wt. *et* Arn. 318  
**Ventilago madraspatana** Gaertn. 374  
**Vetiveria zizanioides** (L.) Nash 376  
 Vitis quadrangularis (L.) Wall. *ex* Wt. 134
- Zanthoxylum budrunga (Roxb.) DC. 379  
 Zanthoxylum limonella (Dennst.) Alston 379  
**Zanthoxylum rhetsa** (Roxb.) DC. 379  
**Zingiber zerumbet** (L.) Rose. *ex* Smith 381